CIO

THE MAGAZINE FOR INFORMATION EXECUTIVES

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SEVEN DOLLARS

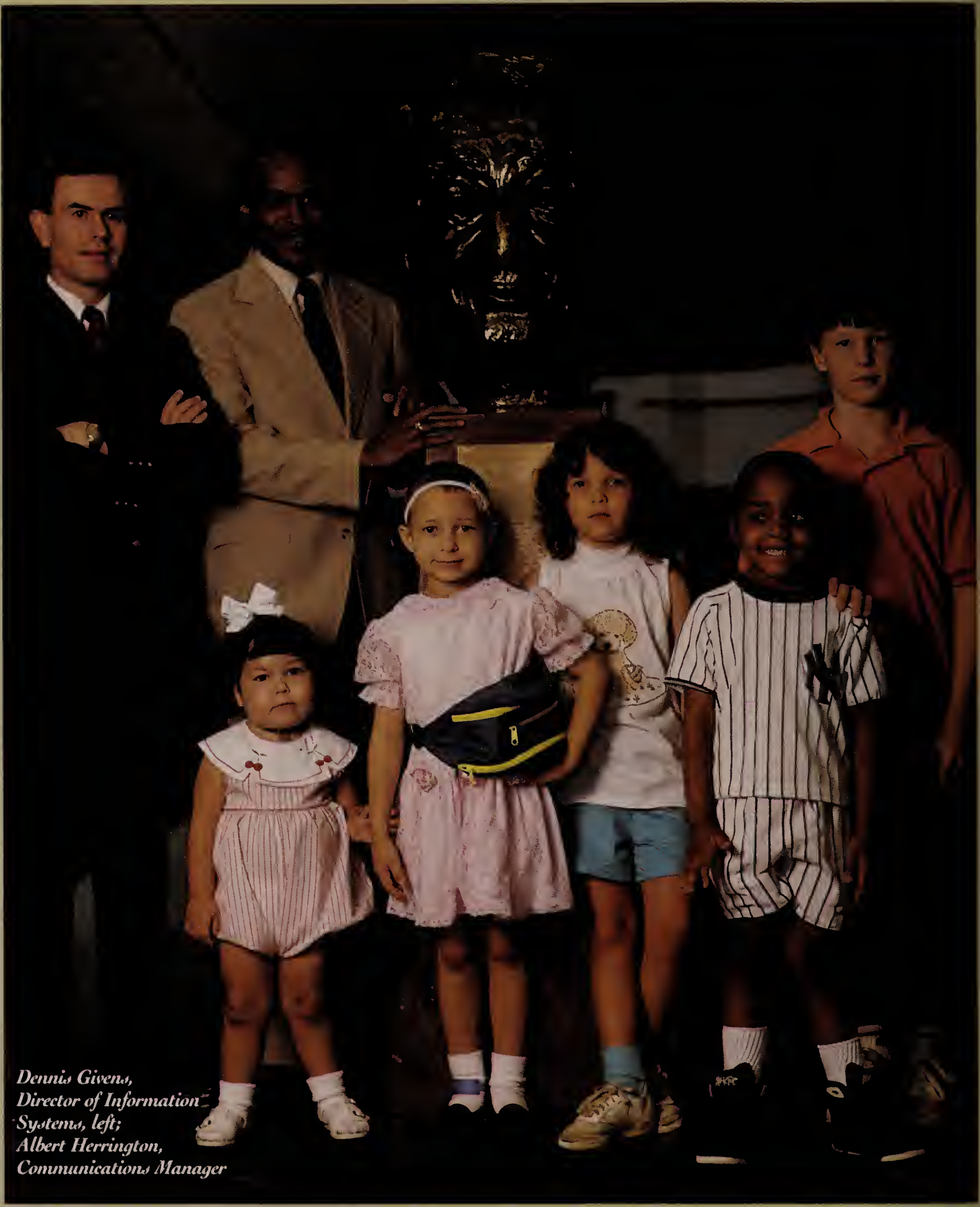
SPECIAL SECTION

STRATEGIC OUTLOOK ON THE DATABASE CHALLENGE:

Unifying The Data Empire

Brian Meakings of the U.K.'s Office of Population, Censuses and Surveys

AN INTERNATIONAL DATA GROUP PUBLICATION



Dennis Givens,
Director of Information Systems, left;
Albert Herrington,
Communications Manager

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That ability, however, was not always there. As Communications Manager Albert Herrington said: "We wanted to build an environment where systems were not stumbling blocks to doing research. But a lack of integrated computing resources hampered us."

"Compounding the problem is the fact that we track patients for years," Givens added. "And each one has hundreds of records generated by doctors, biostatisticians, psychologists, pathologists, pharmacists, the list goes on."

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"Digital is a solutions vendor," Givens said. "They recommended what was best for our specific problems – and in some cases, that even meant they recommended someone else's equipment."

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VOLUME 6, NUMBER 2

A data dominion **48**
Cover Photo by Stephen Dodd/ Liaison International

STRATEGIC OUTLOOK THE DATABASE DILEMMA

Data, Data, Everywhere... 31

And if you want to get it seamlessly into the hands of the right people at the right time to do your organization some good, there's sure to be hell to pay. But consider the alternatives.

By Megan Santosus

Keeping Your Info Honest 42

What's in a name? Everything, when it comes to integrating distributed databases.

By Thomas Kiely

Helping databases...

Her Majesty's Data Guardians 48

At the United Kingdom's Office of Population, Censuses and Surveys, protecting the integrity and confidentiality of data is a directive of the highest order.

By Thomas Kiely

Model Citizen 52

In 1976 Peter Chen created the much esteemed "entity-relationship" database model. Like little else in the world of high technology, his creation has kept its relevance over succeeding generations of change.

By Thomas Kiely and Lew McCreary

...take shape **42**

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BUSINE

INTERN COMPET INTENSII

One by one, world trac falling, leading to the r truly global marketplace.

Aided by the substan throughs in telecommunic computer technology, many are finding it easier than ever enter markets around the wo were previously unreachable.

Even the smallest firms are to compete on a global basis, anc are finding that overseas marke greater growth potential than d markets,which may be flat or satu.

However, this advent of inc global competition has had a bruta on price margins.

Local firms which had previous protected by tariffs or governm port are now finding themselv pressed to compete with the ne of global competitors, who economies of scale are offerin quality at lower prices.

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With the introduction of new multi-dimensional modeling and financial analysis software, the quality of financial forecasting has risen substantially over the past few years.

New spreadsheet technology such as CA-Compete!, which allows the creation of a multi-dimensional cube of data as

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werful and are wooing traditional vironments. NIX, AS/400, 2 offer incredible breakthroughs and (graphical user interfaces).

hardware platforms are sers await proven, mission-are to run on these exciting ns.

WN-SIZING REND CELERATES

ll be needed is a way to integrate nnovative, new, cost-effective plat- and technology with clients' exist- ystems and investments.

one can afford to walk away from past investment and start over. ouring hundreds of millions of dol- IS systems for several decades, America is starting to demand ty from its MIS departments.

Return On Investment) of IS difficult to measure and ssible to project. But still, ngful way to assess it must be found.

ne aspect of it that is easy to and that is the amount of n existing IS systems.

g back and adding up the ment in systems, training, development, etc., it's easy to how much a corporation will andoning its current systems.

corporations who have under- s exercise, it can be quite a experience. It also puts in a w light proposals to scrap exist- ms. ■

INVESTMENT PROTECTION #1 PRIORITY

many hardware and software ven- e proponents of "starting over" for us self-serving reasons, it is rarely a -efficient or rational move for clients.

nstead, prudent clients focus on evolu- onary technological advances, as pposed to revolutionary ones. There's o reason to throw away existing sys- tems when there's always technology that integrate the old with the new.

CIO

FEATURE

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Salaries are lower. Budgets are usually tighter. But a number of non-profit organizations have still managed to field IS organizations that put their commercial counterparts to shame.

By David Freedman

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INSIGHTS: DISPERSION THERAPY 26

Fully distributed databases, when they finally materialize, will solve coordination, security and recovery problems across the enterprise.

By Charles R. Ullrich

STATE OF THE ART: INFORMATION, PLEASE 66

Today's computer user can get just about any information imaginable online. But with the user base for online services broadening and the variety of services expanding, the decision to go online is no longer a no-brainer.

By Megan Santosus

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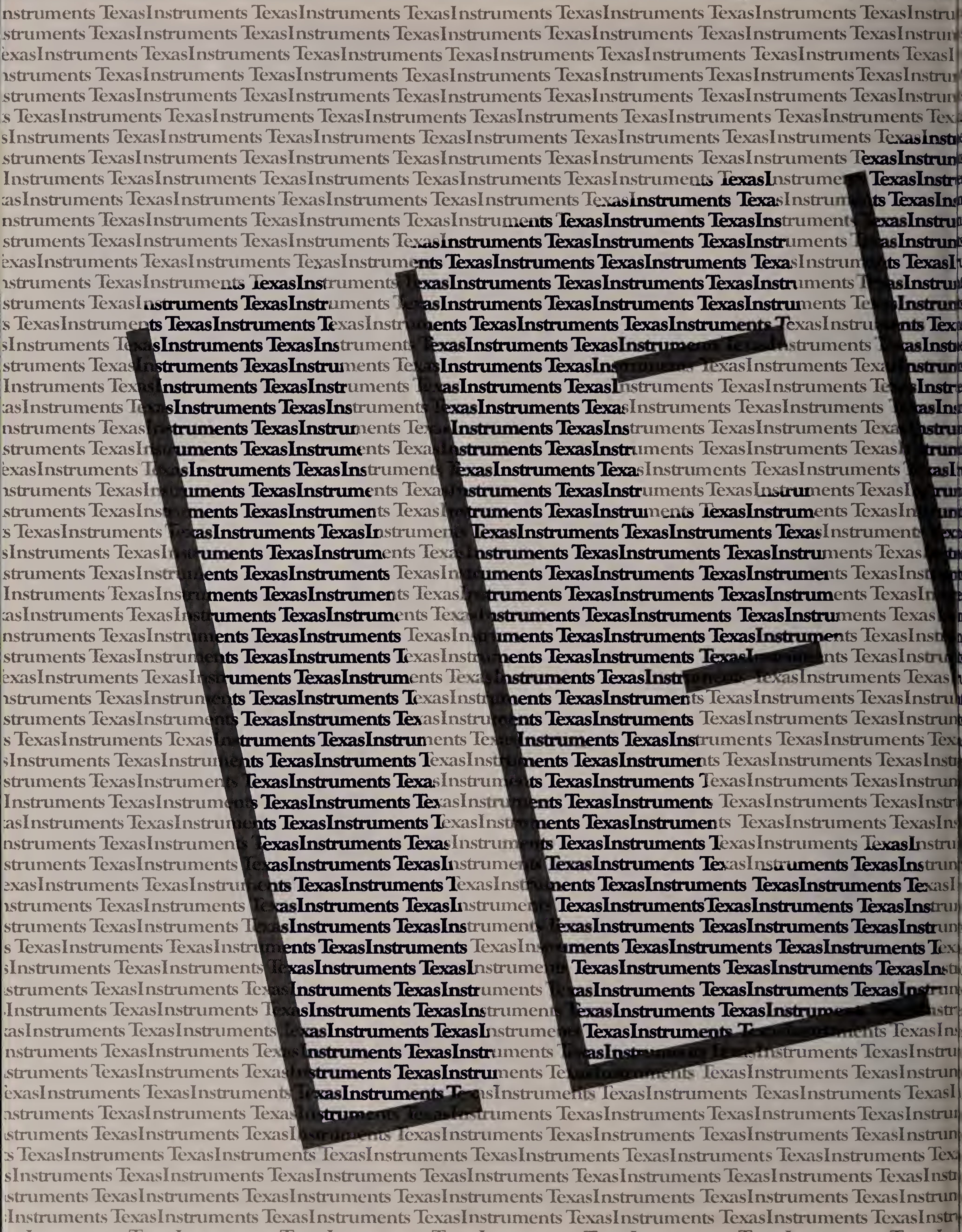
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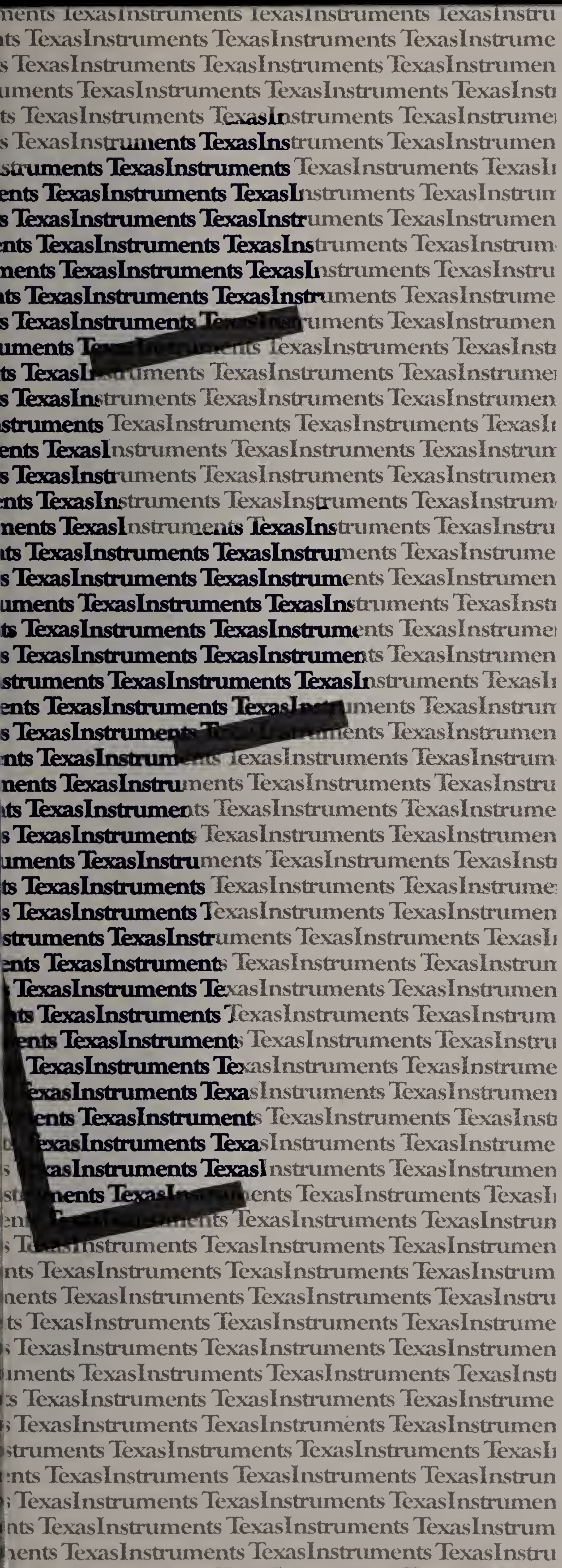

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LETTER FROM THE EDITOR

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Achieving data integration while ensuring information integrity is key to creating today's database environment. Yet these challenges seem overwhelming to many information executives as they grapple with transforming old mainframe-based databases into enterprisewide information treasuries. Making information widely available to end users across a web of technology platforms is an enormous undertaking, and the difficulty of guaranteeing the integrity and reliability of that data cannot be overestimated. This makes the old debate about whether a hierarchical or relational database structure is the right approach seem downright prehistoric.

One thing is certain: There is a lot of hand-wringing and teeth-gnashing going on when it comes to managing corporate data. Senior Writer Thomas Kiely and Writer/Researcher Megan Santosus uncovered many instances of these headaches and travails in reporting our Strategic Outlook, "The Database Dilemma," beginning on Page 31. Information executives, it appears, have no common approach to resolving the dilemma.

The plethora of bridges, gateways and other technical fancywork used to integrate data will only partially solve the problem, according to many database experts. An equally serious concern is how to manage the data so that it is easier to use by corporate denizens. Because the technical hurdles of integration are so enormous, some charge that CIOs lose sight of the bigger picture—the role of information as a corporate asset. Our interview with Peter Chen, the designer of the entity-relationship database model, provides some perspective on the necessity of relating databases to the business process.

The database dilemma is a perfect example of CIOs being under the gun to reconcile the technical and business-value facets of IT.

Marcia Blumenthal

CIO

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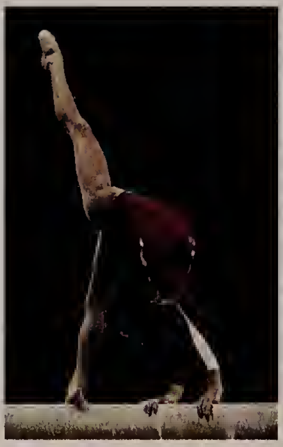

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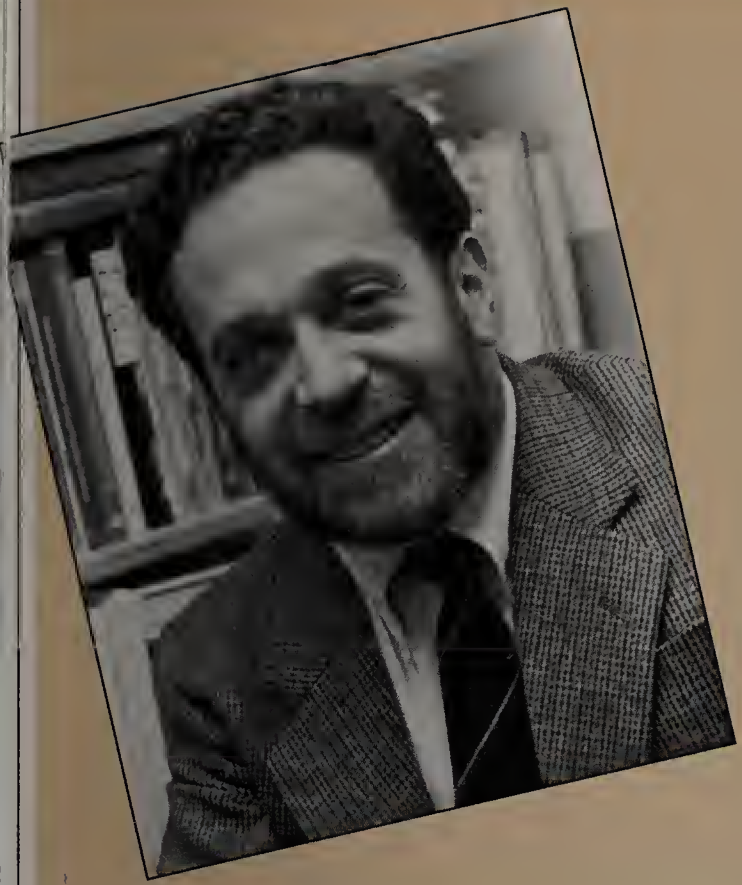

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TEXAS INSTRUMENTS

LETTER FROM THE PUBLISHER

It's clear from our editorial research for this issue of *CIO* that database technology is evolving as quickly as the information needs it is meant to address. Despite important evolutionary advances in the technology—from flat file to relational to the new object-oriented databases—the critical success factor for any database continues to be human involvement. After all, it's people who design databases, input the data they contain and access the information to do their jobs.

At a higher level, top-management input seems to be directly related to the success or failure of the database-design process. Top management must provide the vision of where the organization is headed and communicate anticipated business changes to database architects. In the absence of this type of high-level input, the database is likely to be outdated long before it passes the alpha test.

The orchestration of the enterprise's database strategy rests on the CIO's shoulders. But this responsibility extends beyond selecting the technology and hiring database designers who can think like businesspeople. The CIO must help top managers articulate the enterprise's current and future business needs by asking the right questions and involving them in the database-design process. And it's the CIO who must translate business needs into viable systems that can evolve with the rapid pace of business change.

We hope the information in this issue of *CIO* will help you take a fresh look at your role as database strategist and leverage your ability to involve top management in designing database solutions that support current and future business goals.

PHOTO BY GEORGE SIMIAN

Coming In CIO

On Location: Made in the U.S.A.

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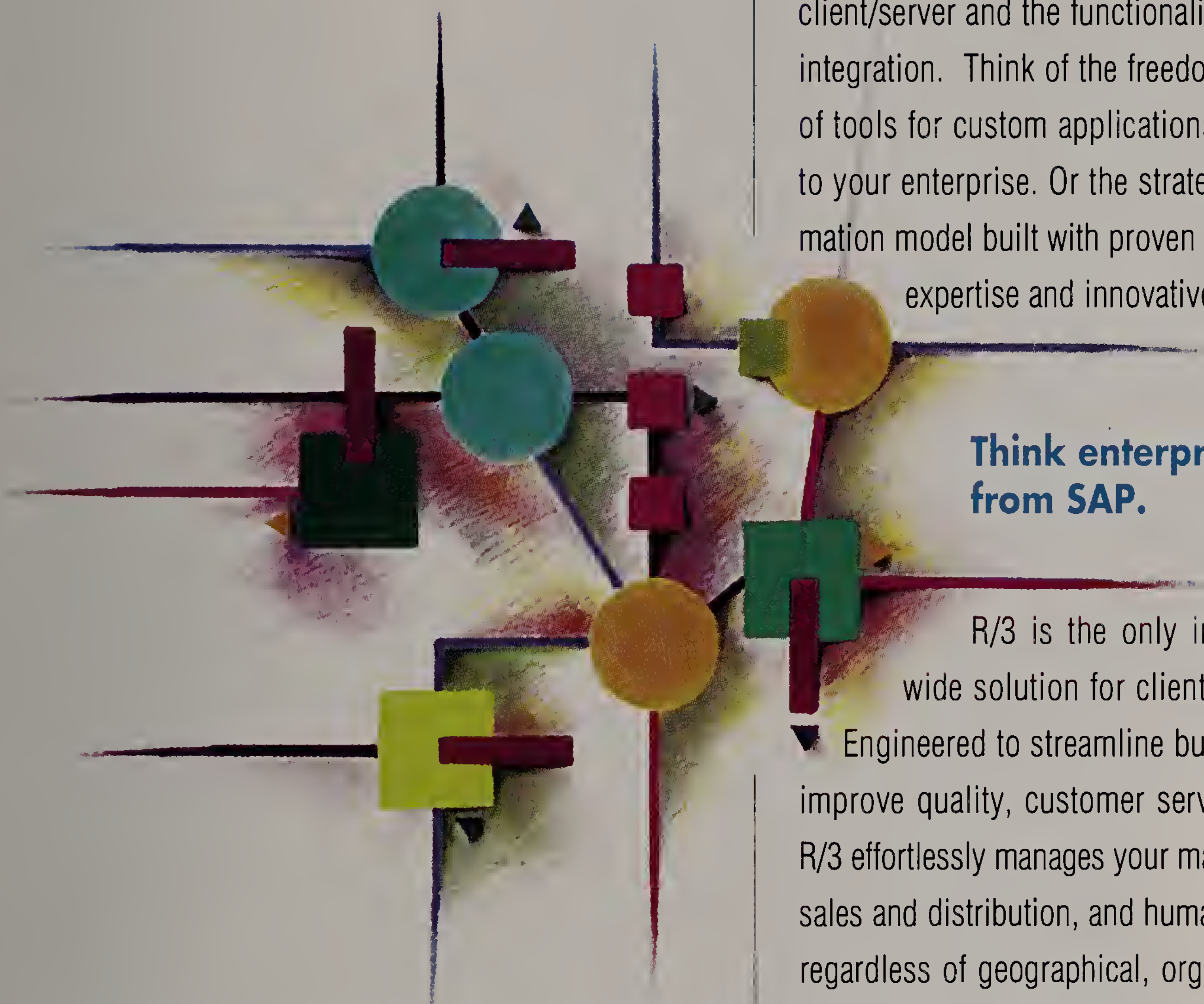

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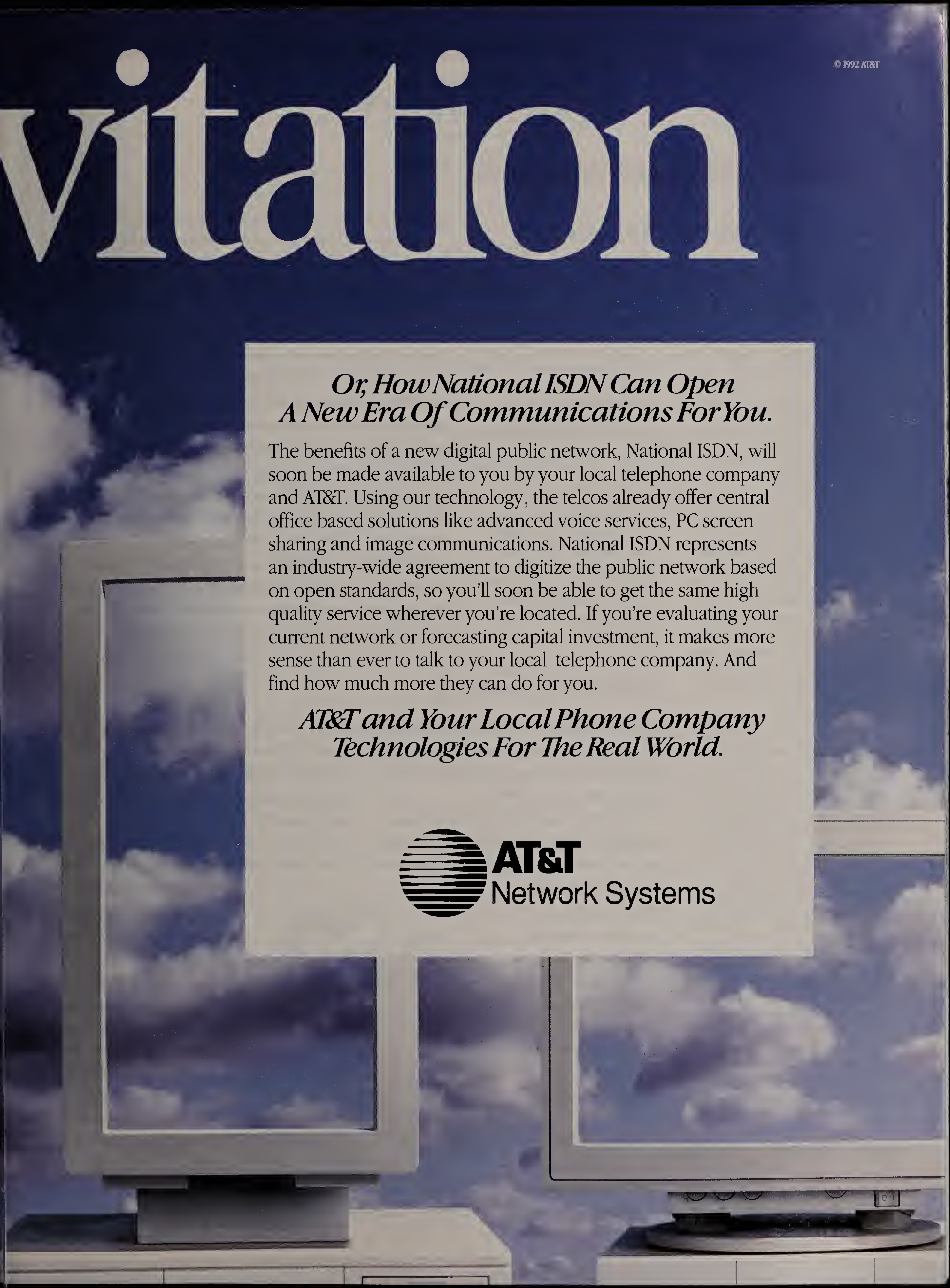

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TRENDLINES

HELPING THE HOMELESS

A MAILBOX OF ONE'S OWN

At a time when technology is getting a bad rap for displacing workers, voice mail is helping the people who need jobs most find employment.

Since July, participants in the job-placement program at Dallas's largest homeless shelter have had free use of 100 voice mailboxes, donated by Tigon Corp., a Dallas-based subsidiary of Ameritech. "The voice mailboxes are used by the residents who are completing the job-counseling program and are looking for employment," said Ray Bailey, director of operations for the Dallas Life Foundation shelter. "It is difficult to find work when you are unable to give a prospective employer a phone number where you can be reached."

Dallas Life provides residents with apprenticeships at the shelter so that they can gain skills in areas such as food service, security and mechanical maintenance. Using a voice mailbox is another crucial skill in today's work environment, Bailey said.

The Dallas shelter is not alone in its efforts. Two years ago The Worker Center in Seattle, a nonprofit agency that helps find jobs for the unemployed, started the Community Voice Mail (CVM) program in an effort to eliminate phonelessness as a barrier to employment. During the 1991 pilot, 148 people used 50 mailboxes placed in human services and employment agencies. Of the 854 job leads and employer calls received, 126 resulted in job placements.

The system was designed to resemble a residential answering machine. Users receive personal seven-digit phone numbers and security codes and record their own messages, which are accessible 24 hours a day.

CVM is now available to 15 Seattle-area agencies providing housing, health, nutrition and employment services. Capacity has been expanded to 200 mailboxes (30 for Spanish speakers). A centralized, in-house PC runs software donated by Active Voice Corp. of Seattle.

The phoneless are not the only beneficiaries of CVM. "Case workers don't have to take messages or track down hard-to-reach clients, so they are more productive," said CVM Co-Director Rich Feldman. ■

MELLON'S STEEL DEAL

National Steel Corp., a $2.5 billion steel company in Pittsburgh, will outsource all of its data processing to a local bank. Under the terms of the agreement, which was signed at the end of August, National Steel will move software for it's payroll, human resources, general ledger and accounts-payable, and other processing chores, onto hardware at Mellon Bank Corp.

National Steel had previously outsourced these operations to Genix Group, a sister company until 1990 when Genix was acquired by Detroit-based MCN Corp. (In fact, a decade ago Genix was National Steel's data center.) As the contract drew to a close, Genix lost the renewal to a bid from Mellon's outsourcing unit. The steelmaker was apparently undaunted by ruffles at Mellon: The Bank's largest outsourcing partner, Dollar Dry Dock Bank, went belly up in February; and in August Mellon took its former CIO, Bipin C. Shah, to court, complaining that Shah used his position at the bank to launch a competing transaction-processing firm.

Neither Mellon nor National will disclose the terms of the multiyear contract, but a Mellon spokeswoman says that the deal is larger than the combined outsourcing contracts Mellon currently has with about 700 banks. National hopes to complete the conversion by late November. ■

THE COFFEE CONNECTION

The Beat Generation is gone. The Byte Generation has arrived. And the slackers and cyperpunks who haunt San Francisco's famous coffeehouses aren't on the road again—they're online.

It's been more than three decades since Kerouac prowled and Ginsberg howled in the Bay City's cafes, but black clothes, steaming espresso and heated political discussions are still the norm here. And now, according to a recent report in *The New York Times*, the computer culture has penetrated these bastions of disaffected youth, in the form of a computer network that connects the patrons of more than a dozen cafes.

The network, called SF Net, was designed by a local computer consultant, who installed screens and keyboards in coffeehouse tabletops. Users pay 50 cents for 20 minutes of electronic conversation with patrons of similarly equipped coffeehouses. Conversations are arranged by topic, including politics, books and philosophy.

The network has other uses as well. The *Times* spoke with one young man who lives in an abandoned building and uses SF Net as his telephone/mailbox, coming by each day to pick up his E-mail and leave messages for friends. And the network is a great way to make dates. "You don't need to worry about rejection," said Amber Clisura, who met her boyfriend through SF Net. But sometimes "they sound cool on the board, but then you meet them and it's not pretty." ■

ILLUSTRATION BY FRAN O'NEILL

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VOICE SYNTHESIS

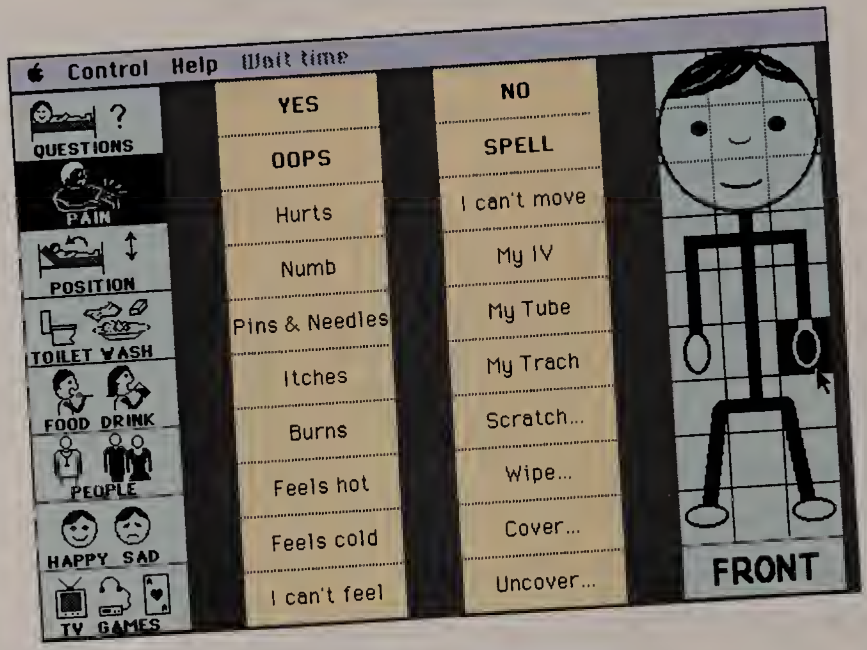
PUTTING THE ILL AT EASE

The Hospital for Sick Children in Toronto is using the power of information technology to help its ICU patients tell caregivers where it hurts—and a whole lot more.

Many hospitals use flash cards to help incapacitated patients communicate. Physicians at the HSC were looking for a way to make the system more effective and more appealing to kids when Dr. Geoff Barker, director of critical care, suggested using computers. The idea won immediate support; the only problem was "how would the nurse and the patient both look at the screen at the same time?" explained Gordon Tait, intensive care unit systems manager. It occurred to Tait that with Apple's MacInTalk voice-synthesis system, the nurse wouldn't need to look at the screen at all.

Tait developed the system, dubbed My Voice, in conjunction with nurses and the recreational and occupational therapy departments. Patients select from a series of screens containing up to 30 basic messages relating to pain, emotions, needs and wants. On some screens, users combine verb structures and objects, such as "I want to speak to" and "mother" or "nurse." Others include a body figure with a grid superimposed over it; patients select a body part (left shoulder) and a sensation (numb, hurts, itches) or a verb (please scratch).

The computer is mounted over the bed so it is easy for the patient to view and out of the way of medical personnel. Patients operate the system with a track ball that sits beside them on the bed. It can be operated in traditional point-and-click mode or, for patients with limited use of their hands, in a timed mode (an item is selected by leaving the cursor on it for a variable length of time, which is set by the nurse according to the proficiency of the user). Computers of patients with no use of their hands are equipped with Personics' View Control System, which operates the system ultrasonically through head motion.



SCREEN SHOT COURESY OF GORDON TAIT / HOSPITAL FOR SICK CHILDREN

The system is now commercially available from Medisoft in Newport Beach, Calif. ▬

NOT-SO-SPECIAL EFFECTS

Just because Steven Spielberg is America's favorite filmmaker doesn't mean we're suckers for special effects. A new study of audience responses to computer-generated graphics shows that people are turned off by complex, state-of-the-art visuals.

According to the study, which was sponsored by 3M, audiences respond best to a speaker who uses technology as a presentation aid. Response declines rapidly when the speaker takes a back seat to complex on-screen visuals.

Simple computer-generated graphics such as bullet, pie or bar charts improve listeners' perception of the speaker, as well as comprehension and retention. But charts should contain only relevant data—audiences are confused by graphics that are only marginally linked to the material being discussed.

Animation can also be very effective, as long as it's kept simple—such as bar charts that grow or text that is revealed line by line. The use of transitions such as wipes and fades between graphics detracted significantly from the audience's perception and retention.

"Until now, audience perceptions have kept pace with the state of the market for presentation products," said Michael L. Threinen, 3M's computer-based presentation systems product manager. "This is the first time we've found a gap between the state of the art and positive audience response." ▬

TYPING, SHORTHAND, SOME SNAKE-HANDLING REQUIRED

Jobs are like snowflakes—they may look the same at first glance, but no two are exactly alike. Companies that run job notices consisting of a title and generic description of duties may attract a horde of ill-qualified applicants, wasting the manager's time and improving the odds of a bad hire. The solution, according to KnowledgePoint, of Petaluma, Calif., is specificity. Its DescriptionsWrite Now! helps managers write customized job descriptions that eliminate confusion about qualifications, responsibilities and prospects for advancement.

DWN! contains a library of more that 2,400 job titles ranging from academic counselor to zoologist. Users can locate and merge job duties from any number of job descriptions; the program then custom-writes information on supervisory responsibilities, qualifications, physical demands and work environment based on the user's answers to questions. The software also helps users comply with the Americans with Disabilities Act and other employment legislation.

KnowledgePoint says its product can help improve productivity by ensuring that employees know what is expected of them and can deliver. It should also come in handy for CIOs who are thinking of switching careers and want to know what it takes to become a ranch cook, say, or a fashion model. ▬

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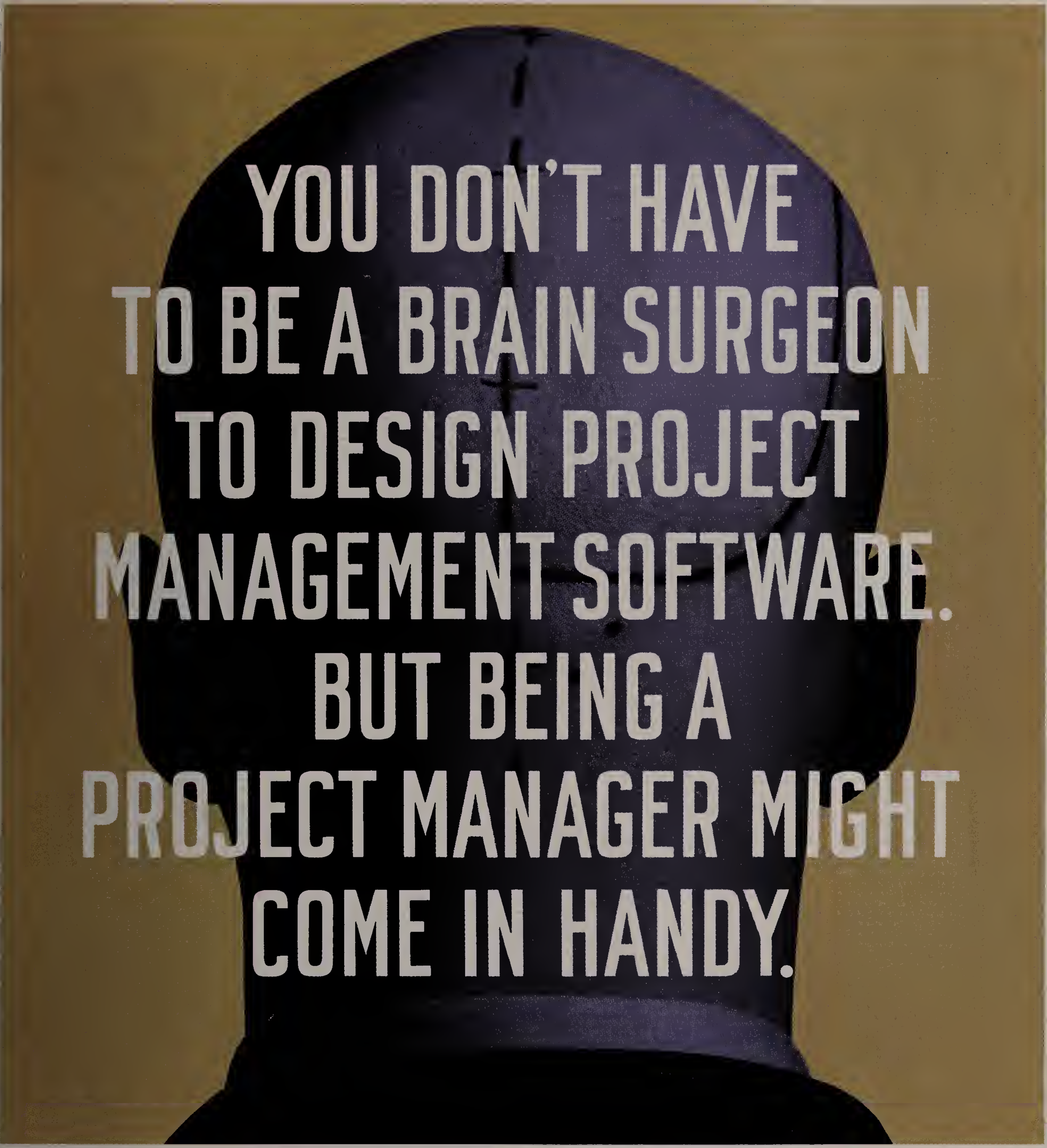
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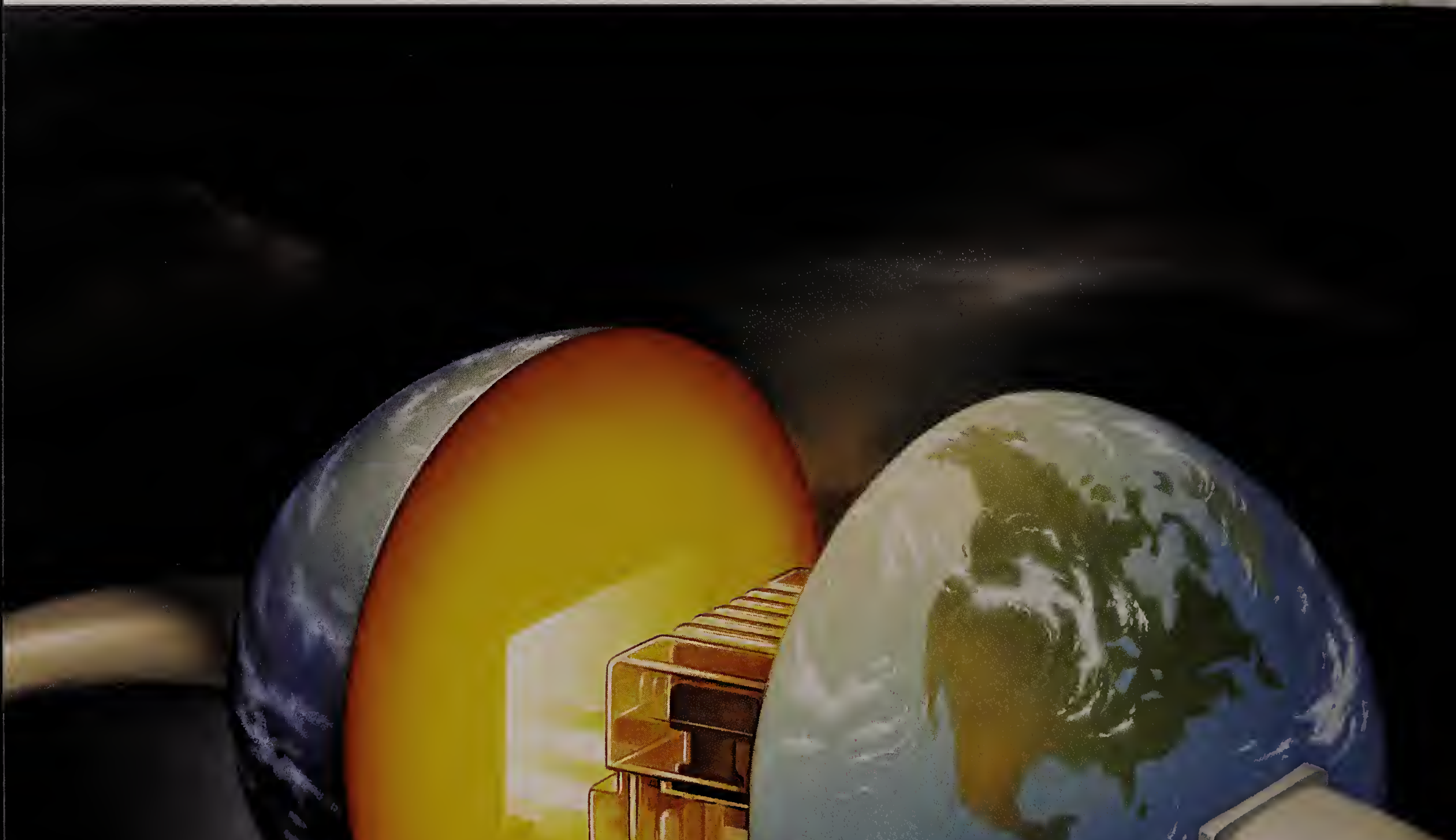

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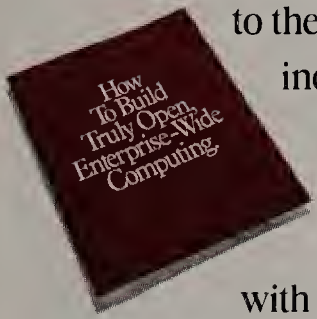

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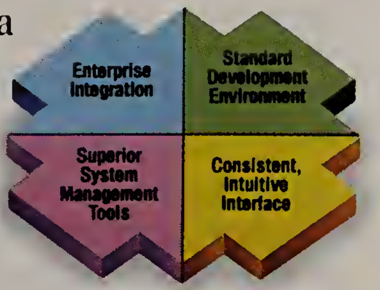

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TRENDLINES

SIM LEADERSHIP AWARDS

PARTNERS IN PRIME

Dynamic duos from Cigna RE Corp. and Roadway Express Inc. took home this year's Society for Information Management Partners in Leadership Award. Together these executive partners prove that the combined powers of enlightened IS and business leadership can be a potent force for companywide change.

Cigna RE, the Philadelphia-based division of Cigna Corp. that insures other insurers, volunteered in 1989 to be the proving ground for a business-process reengineering pilot. During the 18-month, $3.24 million project, Cigna RE replaced 85 percent of its existing systems, in the process reducing the number of systems from 15 to five. The bottom-line results include a 40 percent reduction in operating expenses (about $1.5 million in annual savings), a 30 percent reduction in systems and administration head count, and a dramatic streamlining of policy underwriting that cut a two-week process down to 15 minutes.

The partners who led this effort were Francine Newman, Cigna RE's president, and Raymond Caron, senior vice president and president of Cigna's information systems division. The secret of their success: "We both recognized that we needed to make changes, and we were both determined not to be constrained by the traditional ways of doing business," Caron said.

The IT chief credits Newman with the courage to volunteer for an experiment that would completely remake Cigna RE's work processes, job responsibilities and accountabilities. Such dramatic change required not only a strong stomach but a strict hand. "She had to step in and take firm stands that this change was going to happen," Caron said.

For his part, Caron made certain that IS bureaucracy and inflexibility didn't stand in the way. "We had to go with new technology [IBM's OS/2 LAN operating system and the C++ development language], so we had to bypass some of our technology standards," he said. Without Caron's commitment, this would have been next to impossible given the department's bureaucratic history. Even when the executives' combined powers were brought to bear, the project proved grueling and was plagued with false starts. Caron's counsel to his peers: "I don't advise it for the faint of heart."

FRANCINE NEWMAN *and* **RAYMOND CARON** *(above) "were determined not to be constrained by the traditional ways of doing business."* **MICHAEL WICKHAM** *and* **GERALD LONG** *(at left): "Each success strengthens the partnership."*

PHOTO ABOVE BY CHIP YATES. PHOTO BELOW BY RANDY HUGHES

Roadway Express President Michael Wickham and IS head Gerald Long began their award-winning partnership on the wrong foot. As a former Roadway field division vice president, Wickham had firsthand user experience with field support systems that didn't work quite right. So as president he cast a skeptical eye on IS's ability to deliver, even as he hoped to integrate IT into the business plan and deploy it as a tool for corporate differentiation.

"That was the biggest roadblock to get over," noted Long, vice president of Roadway's IS subsidiary, Summit Information Systems Inc. in Akron, Ohio. Long helped shatter Wickham's skepticism by delivering short-term paybacks from long-term systems initiatives. For example, Roadway's customer-site shipment-management system has boosted business among user customers—a short-term payback for a system intended as a long-term customer service differentiator. "Now [Wickham] has confidence in us. Each success strengthens the partnership."

Wickham's own contribution came in creating an environment where IS could be a potent contributor to change. He made Long his direct report and a member of the business planning committee. "Now there's no distinguishing between the business plan and the IT plan," Long said. Wickham also helped smooth the way for change by ensuring that employees displaced by process-reengineering could train for jobs in other parts of the company. "That way," Long said, "people weren't afraid to make suggestions that could impact their jobs."

All four executives will be formally honored this month at SIM's annual conference in Universal City, Calif. ■

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TRENDLINES

REPORTER'S NOTEBOOK

SCRAPING THE RUST OFF THE RUST BELT

HELD ON *the campus of Saginaw Valley State University, "Gearing Up" gave Midwestern manufacturers a chance to network. Whirlpool's* **ALAN WOOD** *(below) explains factory simulation modeling to one attendee.*

PHOTOS BY LEW McCREARY

The Midwest has more cows than manufacturers, but it's probably close. These days, though, the cows are doing better than most of the manufacturers, and that's no contest at all. The Midwestern manufacturing ecosystem, which is largely dependent on the good health of the Big Three automakers, is sorely afflicted and struggling to recover.

But manufacturers are an earnest, hardy and resilient lot. Give them a pain in the neck, and they'll invent a chiropractor. Looking for some relief, many regional manufacturers convened for two days late in August at Saginaw Valley State University, about 100 miles north of Detroit, to see if they could pick up some new ideas.

The event that drew them, called "Gearing Up," was a novel networking opportunity where small manufacturers could sample the variety of resources available from state and federal agencies, research laboratories, academic institutions, trade associations and their larger manufacturing brethren.

The message from the government representatives was, "We are here! You pay for us whether you use us or not. So use us!" This is a message few manufacturers may have heard before. But the now-well-documented "U.S. competitiveness problem" has finally penetrated the statehouses and federal agencies. And there seems to be some determination to address such dire statistics as one quoted by keynote speaker Leo Reddy, president of the National Coalition for Advanced Manufacturing: America in 1990 ranked 20th out of 22 industrialized nations (just ahead of Bulgaria) in per capita investment in machine tools. Pretty scary.

We may not be ready just yet to consider a national industrial policy, but the feds at least want to stick their oar in. The exhibit floor was densely populated with booths from government labs (Lawrence Livermore and Berkeley, Los Alamos, Sandia, Argonne, the Department of Energy's Ames Lab, NASA's Lewis Research Center). The Department of Defense's Strategic Defense Initiative folks were also on hand, perhaps prospecting for customers interested in more-earthbound applications of laser technology now that the Evil Empire is itself preoccupied with ploughshares.

Several breakout sessions presented potentially useful advice on how to pursue these various offers of help. There were 10 breakout tracks, each with profusions of specialized sessions ranging from the deeply arcane ("welding and joining" and "cost-effective machining of ceramics") to the warmly familiar ("deploying information technology," "faster to market").

Perhaps most helpful were sessions led by process managers about new manufacturing techniques and methodologies. Whirlpool's Alan Wood told of using factory-simulation software to cut six months from the design and implementation of a new multimodel refrigerator assembly line. Jeff Moore and Greg Schaff, of United Technologies, described how their UT unit reconfigured shop-floor operations so that empowered team members run clusters of dissimilar machines to produce finished parts. (Before, there were several lines consisting of many individual operators running similar machines to produce partially processed parts.)

The predicate of many new manufacturing approaches is to squeeze as much overhead as possible out of the process. "All the low-hanging fruit of eliminating direct labor has been picked already," said EDS consultant Joe Donnelly. That leaves such strategies as doing away with excess inventory. "If it's on your books and not yet sold," said one manager, "it's costing you money." Thus, said Wood, Whirlpool's new production line won't trigger orders for refrigerator subassemblies until a cabinet has actually been fabricated. And the UT shop strictly limits "work in process" to a fraction of its former inventory levels. "When we make our numbers," said Schaff, "the line shuts down."

Projections are out; business-driven demand is in.

Also in are new methods of reckoning the actual costs of products so that better decisions can be made about where real value lies in the product mix. Traditional function-based accounting methods, which spread expenses across the organization, tend to hide the overhead caused by particular products.

EDS's Donnelly gave a session on "activity-based costing/management," a way of revealing how costs are consumed by products in the form of the various activities that go into their creation. In the extreme case, applying ABC/M might reveal to a manufacturer that its loss-leader could actually be a bonanza in the making.

Gearing Up may not quite set the Rust Belt on its way to recovery. But judging from the level of attendee chin-rubbing and note-taking, particularly during the breakout sessions, some of the rust is flaking off. ■

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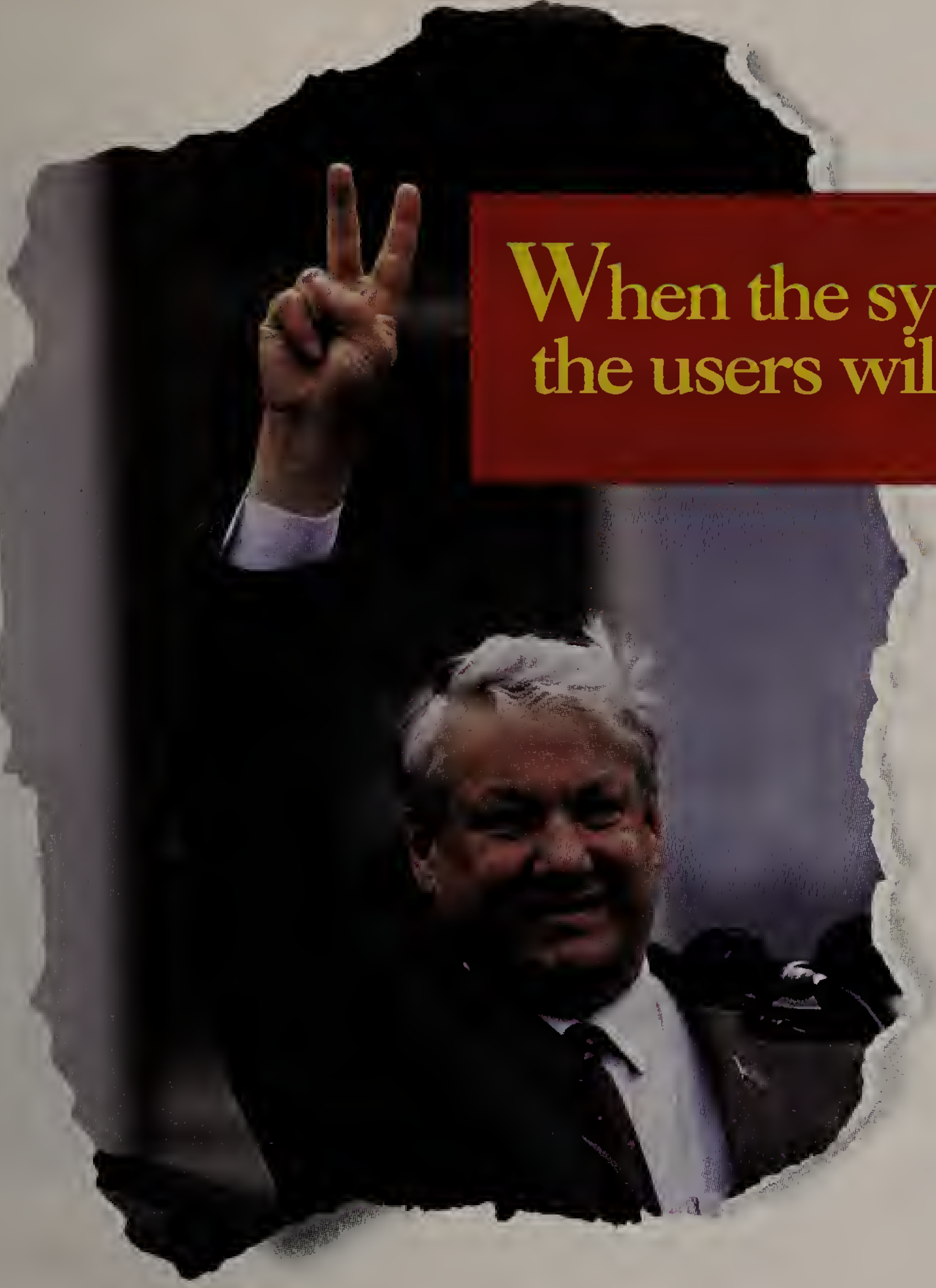

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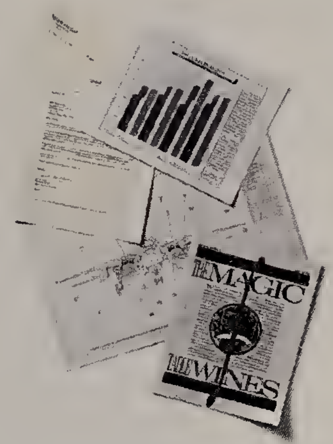

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Fully distributed databases, when they finally materialize, will eliminate the cost and operational disadvantages of centralized systems by bringing the process to the data site

BY CHARLES R. ULLRICH

We are on the verge of realizing full distributed-computing capabilities. Before investing in a distributed solution, however, CIOs should take a hard look at their specific computing needs.

The unparalleled success of personal computing and the advent of downsizing have undermined the ability of IS to effectively coordinate, validate and secure enterprise data. Today, virtually every large company owns a multitude of inexpensive smaller computers, each of which contains valuable corporate data. Once this data has been disseminated to the users, there is no way to rein it back into a single central system. The only solution is to bring the system to the data.

Distributed technology offers a way for IS to once again exercise its managerial responsibilities for enterprise data while allowing users to retain localized operations. Data will remain dispersed across the enterprise, but the distributed technology will keep track of where each piece is located. The system itself becomes the custodian that makes sure, for example, that every customer list is consistent regardless of how many copies need updating. It delivers coordination, security and recovery capabilities for all data across the enterprise.

ILLUSTRATION BY TIMOTHY LEWIS

In 10 years, distributed database systems will be as pervasive as relational database systems are today. The technology is not new; rather, it represents the natural evolution of relational technology. It is the separation of data and process inherent in the relational architecture that makes distributed solutions possible. Distributed database systems are the inevitable consequence of relational technology applied to real-world business problems.

Today there are as many different definitions of a "distributed" database system as there are vendors and consultants to voice them. What many vendors sell as distributed systems are really based on a client/server architecture (basically a subset of a fully distributed database architecture). Client/server technology addresses how clients interact with servers, whereas transparent multiserver technology addresses how servers interact with other servers in meeting the client's needs. In this discussion, a distributed database is defined as a fully transparent multiserver technology, with transparency between servers being the key element.

No vendor currently offers a fully distributed database system. Almost every database on the market has pieces of the distributed puzzle, but no one has put them all together. Vendors claim to have "distributed" systems for the same reasons many

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claimed to have "relational" technology in the early '80s: It's simply a case of marketing hopes outpacing technology reality. But in the next year, truly distributed database systems will hit the market in full force.

When you visualize a global distributed database system, it's easy to imagine millions of transactions firing across the network day in and day out. But the reality is just the opposite. The purpose of a distributed system is to localize both the data and the process. Operationally each site is autonomous, but from a corporate perspective all of the company's data is logically tied together and easily accessible.

One goal of implementing a distributed system is to eliminate any central point of failure so that at least part of the network can always carry on business as usual. If a global credit-card company does all of its processing on a large mainframe in Dallas and the city power station goes down, no one anywhere can process new credit-card transactions until power is restored in Dallas. But if you have computers in 10 locations and the power goes out in one, only a tenth of the worldwide customer base is affected. When the power is finally restored in the affected location, the system will automatically bring that link up to date and it will once again participate in a fully synchronized manner with the rest of the network.

A distributed database system can have a positive effect on cost control too. A large centralized system supporting thousands of users means tremendous communications, line and multiplexer costs. Communications lines are the slowest link, the biggest bottleneck and the least reliable element of a network. Replacing a centralized system with a distributed solution will provide greater data availability and system reliability at the local level, both of which contribute to cost control.

The power of distributed database solutions is impressive, but CIOs shouldn't go out looking for uses for distributed technology. Rather, they should ask: What business problems am I trying to address with a distributed database?

Making generalizations about which types of businesses should or shouldn't implement a distributed database is dangerous—that's how runaway trends get started. But one criterion to consider is whether a business handles data that has geographic relevance. For example, while credit cards can be used all over the world, most of a single card's use occurs in just one city or country. A credit-card company that sent every transaction to a central site would have to endure incredibly expensive communications costs and the inefficiencies of a single large processor.

Replacing a centralized system with a distributed solution will provide greater data availability and system reliability at the local level, both of which contribute to cost control.

But if the company employed a distributed system—with one database in Japan, one in Europe and one in the United States, say—it could reduce both communications costs and processing time. Transactions would be shipped across the network only when customers used their credit cards somewhere other than their usual locale, accounting for only a small minority of the transactions.

The credit-card company would benefit from improved communications and reduced processing costs by using smaller computers. Its customers would benefit from speedier and more accurate billing. If a problem did arise in Japan, the customer wouldn't have to deal with the U.S. office to get it resolved.

At times, a kind of mob psychology takes over the market and users latch onto the latest technology trend with a fervor far exceeding the true value of the solution. An excellent example is the immense popularity of downsizing. Many companies have jumped on the downsizing bandwagon without first examining their real business needs. They followed the crowd blindly and ended up losing control over corporate data resources. This is a mistake CIOs must not repeat with distributed database technology, no matter how attractive the prospect.

Distributed database technology is the perfect solution for certain types of problems, but it is no panacea. There are many data-access problems that do not require distributed solutions. In some situations, a distributed solution makes no sense at all and only adds an unnecessary level of complexity to a company's applications and management structure.

In most cases it will not be specific types of applications that drive the need for distributed databases. Rather it will be the desire to tie together islands of automation, whether they are smaller client/server networks or standalone minicomputers and PCs. If an existing client/server network is self-sufficient—that is, if it does not need to share data with other corporate resources—a distributed solution has little to offer.

While the future may belong to distributed database technology, it is important to note that client/server systems remain a valid solution for businesses today. Many companies that investigate client/server technology will find that it will meet their business needs for years to come. For those who need more, a client/server system with the right foundation provides an excellent springboard into the distributed solutions of tomorrow.

Charles R. Ullrich is senior manager of database technology at Cincom Systems Inc., an independent software firm in Cincinnati, Ohio.

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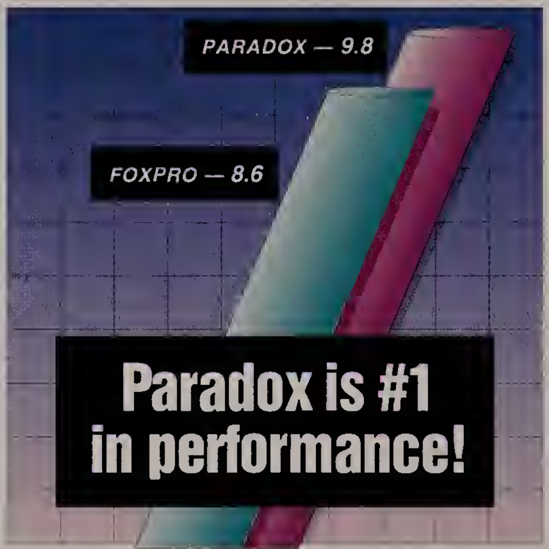

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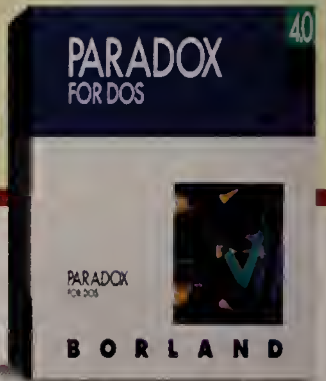

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Software Digest Rating Report, Multiuser Database Programs, May 1992, Vol. 9, No. 2. BI 1573

THE DATABASE DILEMMA

REDISTRIBUTING THE WEALTH

In a perfect world, integrating heterogeneous databases throughout an organization would be as clear-cut as rebooting a PC. CIOs would simply link together disparate database management systems and tie them into a gateway that would seamlessly convert and migrate data. Decades' worth of legacy systems would be replaced with core business applications uniformly rewritten from scratch. In such an IT utopia, end users equipped with trusted front-end tools and friendly interfaces could transparently access a wealth of strategic information residing across an alphabet soup of platforms and operating systems. Unfortunately, integrating databases is about as far from an ideal situation as any CIO would ever care to get.

Data, Data Everywhere...
But if you want to get it seamlessly into the hands of the right people at the right time to do your organization some good, there's sure to be hell to pay. On the other hand, consider the alternatives...
PAGE 32

Keeping Your Info Honest
All the technical ingenuity in the world won't make the trains run on time if data definitions vary from department to department.
PAGE 42

Her Majesty's Data Guardians
The U.K.'s Office of Population, Censuses and Surveys assigns a "custodian" to oversee and ensure the quality of each data set in the organization's domain.
PAGE 48

Model Citizen
In 1976, Peter Chen created the much esteemed "entity-relationship" database model. Like little else in the world of high technology, his creation has kept its relevance over succeeding generations of change.
PAGE 52

THE DATABASE DILEMMA

DATA, DATA, EVERYWHERE...

And if you want to get it seamlessly into the hands of the right people at the right time to do your organization some good, there's sure to be hell to pay. But consider the alternatives.

BY MEGAN SANTOSUS

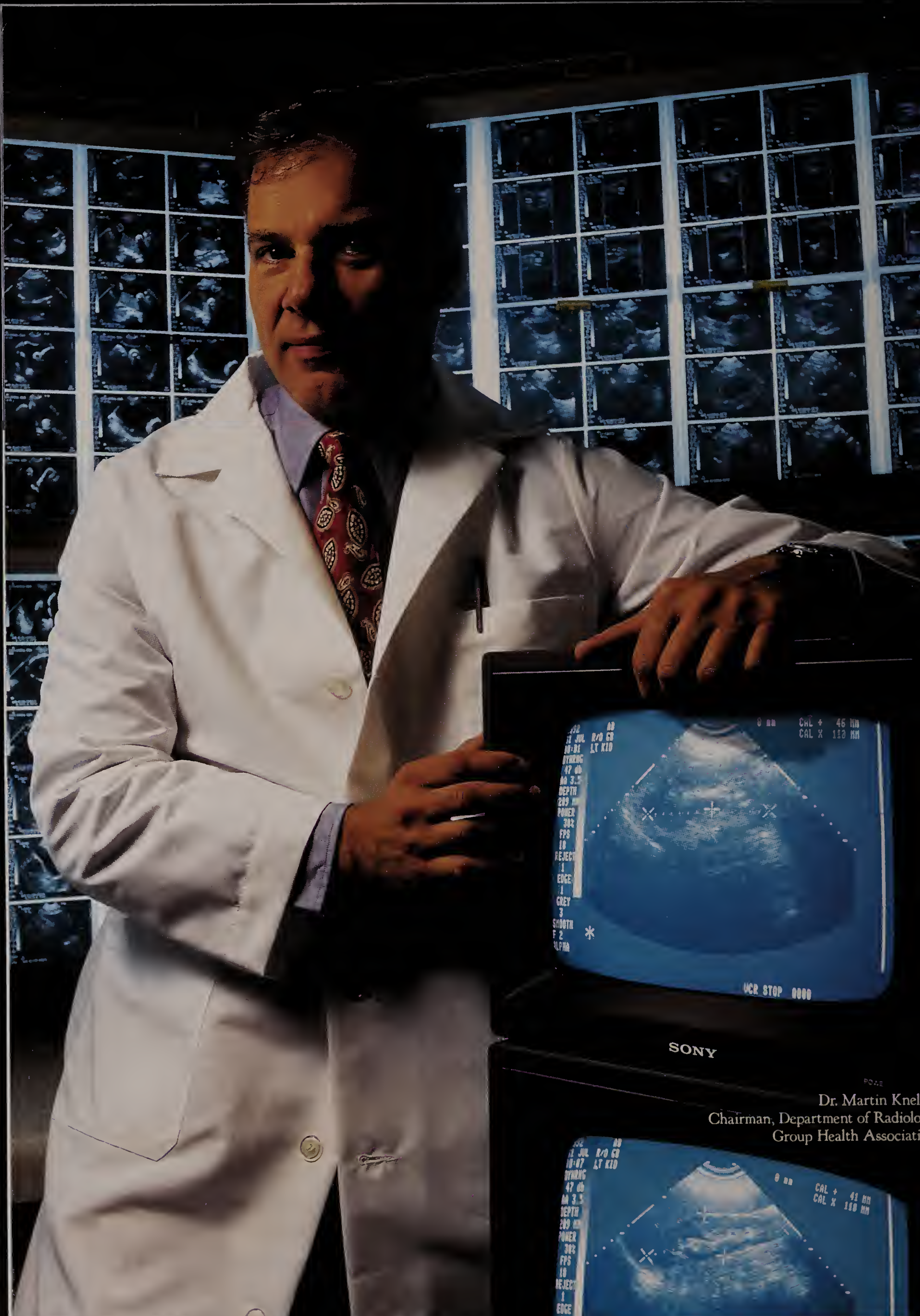
At many companies, the world of decentralized, distributed computing presents CIOs with perhaps their most difficult challenge ever: the need to integrate legacy systems so that corporatewide data—no matter its pedigree—can be quickly and easily delivered to whomever can use it to competitive advantage. After all, information can't be a corporate asset if it's trapped and largely inaccessible within heterogeneous systems.

While it is usually possible to physically link existing systems and adequately move information among them, doing so raises a litany of concerns about data integrity, security, performance, consistency and timeliness. And from both cost and operational standpoints, a wholesale rewriting of applications is usually not an option.

Muddying the waters further is the fact that integration means different things to different IS shops. For some it means providing end-user access to mainframe data, for others, linking departmental systems with LANs and WANs. For still others it means implementing a centralized, standard repository and downloading replicated data to users. Some companies view connectivity as the means to an integrated end; others are preoccupied with defining data standards. Each flavor of integration has its own technical and organizational problems.

The road to data integration is long, complicated and largely uncharted. Nevertheless, most IS executives must address

ILLUSTRATIONS BY FRED LYNCH



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the issue; the one seemingly universal aspect of integration is that it's a strategic decision too important to ignore.

Even if integrated systems could be built from scratch, it would be a complicated undertaking. But most companies must now contend with managing data locked in existing heterogeneous environments. "Most organizations have multiple database management systems," said Jeffrey B. Tash, president of Database Decisions, a Newton, Mass., consultancy. "The issues are how to access all the data, and then how to identify its relevance and quality."

"ANYONE WHO TRIES TO COMPLETELY DOWNSIZE IS [risking] failure. The amount of work is so large and so complex, and there is little evidence that this approach will pay off."
—Rich Finkelstein

"A big problem is figuring out the scope of an integration effort," said Ronald G. Ross, editor and publisher of the *Data Base Newsletter*, published by the Database Research Group in Boston. Above all, such efforts should "enable functions to cooperate effectively," advised Ross (see related story, Page 42). "This must be applied on a larger organizational scale than most people think."

Many companies wanting to move to relational technology and SQL have upwards of 85 percent of their current data stored in non-relational legacy databases, said Tash. "The key is how to bridge and manage the migration to relational databases. The move to relational technology is very important in the move to a distributed client/server environment."

Traditional hierarchical database systems link and store files in a specific order. Relationships among files are confined within the particular system to ensure fast processing. For example, customer records are linked to order records; the only way to access order information would be to look at the whole file, because the location of one bit of information is linked to that of another. This makes traditional databases unacceptably inflexible—good at processing information, but inefficient at accessing it. Relational technology provides the ability to summarize data so that you could query the sales record of a product over the last 10 years without having to go through customer records to get to the data. Relational provides many different paths to data.

According to Rich Finkelstein, president of Chicago-based consultancy Performance Computing Inc., the most practical way to move to relational systems is to replicate the legacy data on new platforms. This approach, while not perfect, combines the best of both worlds: Processing and maintenance remain on the legacy systems; access is provided via the relational systems.

The most cost-effective way to achieve this, said Finkelstein, is to offload legacy data to cheaper, faster machines, like those running Unix or OS/2. One approach is to use specialized packages that "read" data from a mainframe and download it to a PC. Finkelstein suggests that offloading data is ideal for decision-support applications like analysis and reporting, where the replicated data is generally not altered. If changes are made and stored locally, the legacy systems can be periodically updated, although timeliness is sacrificed for access.

Finkelstein is not proposing a wholesale rewriting of legacy applications. "Anyone who tries to completely downsize is [risking] failure," he said. "The amount of work is so large and so complex, and there is little evidence that this approach will pay off."

Finkelstein cautions that making data accessible is only the first step. "Gateways, packages and distributed tools may let people get to the data," he said, "but despite vendors' claims, they do not make data easier to use. It really depends on how data is stored and managed."

Even companies currently using relational databases are not taking full advantage of the technology, said Tash. Many IS organizations using gateways or bridges to migrate to relational technology are looking at the data in the same way as with hierarchical databases. "It's a matter of designing applications to take advantage of database technology," he said. "In most businesses, processes are designed around the flow of paper. However, paper can only be shared when it's moved serially. If the CIO can offer concurrent access, it's possible to reengineer processes according to the data, rather than just automating them."

Yet some CIOs believe that integrating systems consists primarily of overcoming technical hurdles. Herbert Chaplin, director of information services at Ultramar Inc., a petroleum refining and marketing company in Long Beach, Calif., thinks that technology can solve his company's integration problems. Ultramar has DEC VAXes and minicomputers from Hewlett-Packard and Honeywell running in its refineries. Applications include process control, logistics planning, modeling and materials management. There are also many word-processing and Lotus 1-2-3 files running on the machines. With new federal regulations stipulating that safety, training and instructional information be made available to all refinery employees at all times, Ultramar must integrate its information architecture.

"Distributed computing is very complicated," Chaplin said. "We have data in different locations, on machines from different vendors and running in different operating systems. We have real concerns about access, security and integrity."

Ultramar is in the early stages of moving to client/server. "We need to share legacy data within departments [at various locations]," Chaplin said. The company chose a product called Cooperation from NCR Corp., an enterprisewide integrated computing environment that combines the concepts of object-oriented technology, the client/server model and open systems. Ultramar is testing Cooperation on a single server shared among the MIS department and a few users. It will wait for a forthcoming Unix version before making the move companywide.

Although Cooperation's security features can't absolutely ensure data integrity, Chaplin finds them adequate. One advantage is the prospect of a reduced maintenance burden: When installed on a server, Cooperation will integrate with the legacy systems, NCR promises. If bugs or other problems occur, NCR pledges to fix them. Thus Chaplin no longer needs to contact every ven-

"DISTRIBUTED computing is very complicated. We have data in different locations, on machines from different vendors and running in different operating systems. We have real concerns about access, security and integrity."
—Herbert Chaplin

Foundation Work

The data-integration rebuilding effort may be threatened by organizational underpinnings that subvert realistic ways of looking at information flow. The first thing to change could be the hierarchy...

When it comes to data integration, there are no quick fixes or silver bullets, according to Ronald G. Ross, editor and publisher of the *Data Base Newsletter,* published by the Database Research Group in Boston. Since few ever anticipated that technology would advance to the point where linking disparate databases and locations would be feasible, legacy systems grew up piecemeal without a thought to their application in solving corporatewide problems. The famous islands of information took 30 years to form, and they can't be connected overnight.

Ross believes that the challenge of unification is compounded by organizational structure itself, to the extent that it hampers cross-functional views of information flow and data management. To design an integrated architecture, he proposes a fundamental reconfiguring of organizational structure around resources rather than functions.

Traditional organization along strict functional lines has confined executives within specific sets of tasks and impaired their ability to think in terms of the big picture. From a data-management point of view, says Ross, companies need to recognize that information is interwoven among all functions. A company should therefore be viewed as a portfolio of resources requiring continuous management, and not as a collection of functions—which Ross would make subservient to resources.

For example, the resources of an airline would include planes, gates, routes, spare parts, and personnel. Each resource would have what Ross calls a "value chain" consisting of the functions necessary to manage that resource. In the case of personnel, the value chain would include recruitment, training, tracking, compensation and retirement.

Identifying resources and value chains—and the data they share—is the key to building integrated systems. If Ross is correct in estimating that every company has between 10 and 25 resources, the complexity of integration becomes clear. ***—M. Santosus***

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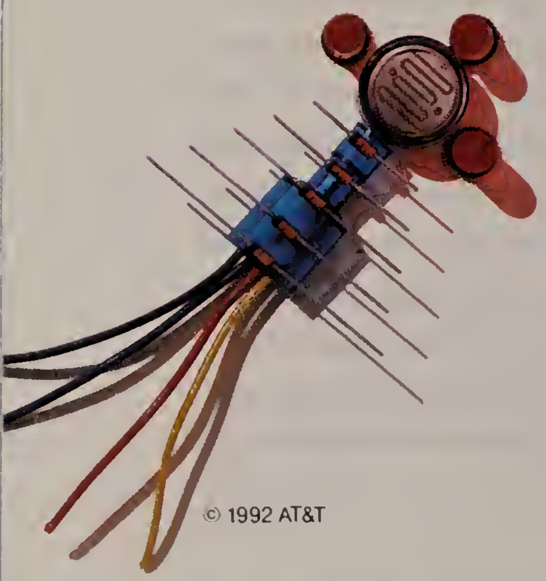

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THE DATABASE DILEMMA

"I HAVE BEEN IN IS for 30 years, and it's never going to be the right time to make an integration decision." —John C. Reece

dor when something goes wrong.

The Microelectronics and Computer Technology Corp. (MCC), a research consortium in Austin, Texas, is trying to solve the problems of logically integrating physically distributed information. The challenge of the Carnot project is to build an environment that allows critical business applications to operate in an open, distributed architecture while retaining the ability to access and manipulate data locked in closed legacy systems. According to Project Director Philip Cannata, developing communications standards is key to providing access to information across heterogeneous systems. Carnot is working to integrate Unix-based DBMSs in a PC-to-mainframe environment using international standards where possible.

"In doing integration," said Cannata, "companies have done everything themselves," so most have highly proprietary, non-standard systems. But international standards are now in place to build an integrated infrastructure. "Companies should at least have a transition phase that brings standards compliance in steps," said Cannata.

The only prerequisite in deciding to integrate is a legitimate business need to do so. Choosing the manner and the method are issues for each individual organization.

"I've been in IS for 30 years, and it's never going to be the right time to make an integration decision," said John C. Reece, vice president and CIO at Alexander & Alexander Services Inc. in Owings Mills, Md. "The key is to integrate in small increments and think of the process as dynamic rather than revolutionary."

Like it or not, the CIO must take the lead. "Because of the organizational impact of integration," said Ross, "no one but the highest-level person can possibly pull it off. In the long run, what we're talking about is changing people's jobs."

SWAT-Team Marching Orders

Establishing terms of engagement for a data-integration effort may save you some stumbles

While there is no definitive approach to integrating databases, most efforts can be separated into three distinct yet related levels addressing the strategic, organizational and technical aspects. In most cases, according to Stuart Madnick, who is John Norris Maguire professor of information technology at MIT, companies should take a SWAT team approach, tackling each level in order, one at a time.

▶ The strategic level is where an organization determines the basic goals of the integration effort—for example, enhancing systems to improve functionality. Unfortunately, goals such as achieving cost savings can be difficult to justify to management and can cause companies to run into trouble.

▶ The organizational level is where many integration efforts hit the ground with a thud. IS must work within the context and constraints of the organization as a whole. For example, attempts to develop corporate standards are difficult if the organization is decentralized. In such a case, either the corporate structure must change or IS must conform to it. Pursuing conflicting approaches should be avoided at all costs.

▶ The technical level is divided into the physical and logical aspects of connectivity. The physical aspect involves the networking issues of connecting platforms and database management systems. Logical is more challenging because it is less understood and involves data definitions. Most organizations have many ways of defining data that usually aren't recognized until they reach this stage in the process.

The process of integrating databases is complex, and organizations can stumble at any or all of the three levels. To improve the chances of success, consultants suggest that long-term projects be divided into smaller pieces that can be accomplished in the short-term. Both senior management and IS like to see the results of their efforts so they know that progress is being made. One way to achieve this is to employ rapid-development and -prototyping tools that can reap rewards in a matter of months.

—M. Santosus

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THE DATABASE DILEMMA

KEEPING YOUR INFO HONEST

What's in a name? Everything, when it comes to integrating distributed databases.

BY THOMAS KIELY

Integrating databases isn't a cake walk. CIOs must sort through a multitude of technical, managerial and organizational quandaries as they mesh diverse systems into bigger cross-functional packages. But connections aren't the only problems CIOs face. The data itself may prove to be the biggest fly in the integration ointment. Data errors that could be lived with in the old systems can muck up the effectiveness of the new compound database. Worse, interlaced data may prove to be as incompatible as Dan Quayle and Murphy Brown.

A case in point: A circuit-board maker integrated its purchase-order system with its production system—and drove its just-in-time manufacturing operations into a wall. The company's assembly lines were stymied when the new, integrated system ordered the wrong parts from suppliers, or the right parts in the wrong quantities, or sent the right parts to the wrong plant. Before the systems were integrated, employees would match printed reports from the two systems and correct inaccuracies. But the combined system—minus the human intervention—matched data error to data error, subjecting the company to a bad-quality reign of terror.

That story is told by Mark Hansen, a principal at QDB Solutions Inc., a Cambridge, Mass.-based company that sells data-quality analysis products and consulting services. (Hansen won't reveal the name of the client involved.) Hansen has a bagful of data-quality horror stories—many of them gathered from his doctoral studies on the topic at MIT. While there is little way of knowing how many companies' systems churn bad data, Hansen says he surveyed about 50 Fortune 500 companies in 1990 while he was at MIT, "and two-thirds of them reported significant problems with the quality of their data."

There are two twists to the data-integrity conundrum. The first is a nuts-and-bolts kink: Systems planners can build technical integrity into new systems—even complicated client/server systems—but there are performance and cost tradeoffs. Do users need the data real-time over a dispersed network? Communications will be an expensive problem, performance may suffer, and programmers will have to pay careful attention to transactional and referential

ILLUSTRATION BY FRED LYNCH

integrity (to ensure against glitches such as data lost during a mid-transaction system failure or users accessing constantly changing data). Want better performance and lower cost? Move duplicate data close to clients and update weekly or hourly, as the business demands, and live with the information lag—and the increased number of data errors.

Steve Pliskin, a partner in the information technology consulting group at Big-Six accounting firm Deloitte & Touche in Chicago, explained that systems designers face "integrity problems galore, and there is no such thing as a problem-free solution."

But the second angle—the human and organizational side of the data-integrity problem—may be more challenging. End users or data-entry clerks may key inaccurate data into systems. (Programmers can write edit checks into applications to make certain that data-entry clerks input valid data—but valid data isn't always factually accurate data.) Even when end users are scrupulous about the data they key into their systems, they may define equivalent data differently from one business unit to another. In either case, poor data quality can make systems integration a nightmare.

"Data quality has always been an issue for systems [groups]," noted Art Files, director of information resource management at the Travelers Companies in Hartford, Conn. "But customers learned to live with their problems. Now, as systems are extended [enterprisewide], the quality of that

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often billed as the mainframe's replacement, but think about that. Client/server systems invite expansion, and as they expand so does the need to manage them.

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Truth is, the only thing obsolete about mainframes is the notion that they're obsolete.

IBM

data affects other business units, and that's a lot bigger issue." (It gets bigger still, added several observers, as companies connect to end users beyond the corporate walls, such as suppliers and customers.)

WHEN NEW SYSTEMS ARE DEVELOPED, THE BUSINESS units affected by them must work together to agree on common requirements, naming conventions and data items.

To cite a common example, within most multinational corporations, separate, geographically dispersed databases will collect different financial information (yen, dollars, deutsche marks) and different product codes for the same products. They might also structure customer databases differently, and so on. Collecting and matching information that ought to be alike but isn't can be laborious.

Even within a domestic corporation, units may approach their business in diverse ways and consequently define like data differently. "Organizations often don't have any idea [of] the magnitude of the differences they live with," said Stuart Madnick, John Norris Maguire professor of information technology at MIT. Madnick notes that at one U.S. insurance company (which he won't name), net premium is the standard business measure—and yet the company has 17 different definitions for net premium, each equally valid.

In an effort to bring order to data chaos, some companies are involving end users in the data-quality loop. At Travelers, for instance, data administrators in each major unit (reporting up the chain of command within the unit, not to central IS) work with business end users to maintain the integrity of the information flowing through the unit. Moreover, when new systems are developed, the business units affected by them must work together to agree on common requirements, naming conventions and data items. They also work within a standard corporate data model—the entity-relationship methodology developed by Peter Chen, holder of the Foster Distinguished Chair professorship at Louisiana State University (see related story, Page 52)—with some modifications (because "it is the easiest one to sell to the business units," said Files).

"There can be no integrity of data without accountability of the data at the source," said Larry P. English, president and principal at Information Impact International, an information resource management consulting firm based in Brentwood, Tenn. "If we're going to have an integrated data environment, we have to have common meanings for data."

Companies must also build flexibility into their systems to allow for differences as the company evolves, English added. The combination of systems flexibility and end-user accountability (anchored to appropriate standards) should help companies build systems that are data-sound and matched to business needs.

That's a formula for systems developed today and tomorrow, but what about legacy systems? English and others advocate a slow migration to new platforms: As old systems are replaced, the new systems will be built to integrate. Moreover, in most companies there will always be a mix of standalone and integrated systems—CIOs can prioritize data-quality standards for different systems.

MIT's Madnick advocates a different tack. "There will always be legacy systems," he said. "In business, the world doesn't stop. What if I convert all my systems, then acquire five new companies next year?" Instead, Madnick and other MIT researchers are investigating technology Madnick calls a "context mediator." He sees the mediator as a tool that will sit on top of a legacy system, helping it to define shades of meaning in data and make appropriate translations. This way, companies can live with their internal business differences—the data will be the common ground.

MIT is also trying to assemble a consortium of user and vendor companies to study total data-quality management. To Madnick, a data-quality initiative ought to contain three elements: a measurement system (what is quality: timeliness? accuracy?); analysis of the value of quality (can we live with 90 percent data accuracy? what is the rippling effect of bad data throughout the company's business—and what does it mean to the bottom line?); and a set of management procedures for improving data quality.

One way a company might decide to improve quality, Madnick said, is to automate processes by which data is keyed into the system, such as using pen-based computers in the warehouse.

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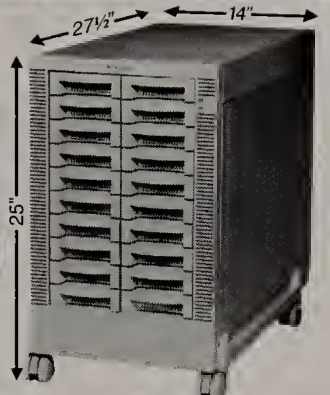

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THE DATABASE DILEMMA

PROFILE

HER MAJESTY'S DATA GUARDIANS

At the U.K.'s Office of Population, Censuses and Surveys, protecting the integrity and confidentiality of data is a directive of the highest order

BY THOMAS KIELY

End users, not IS staff, are the trustees of data at the Office of Population, Censuses and Surveys in the United Kingdom. The government organization handles much of the social and medical data for England and Wales, including decennial census surveys; records of all births, deaths and marriages; cancer and abortion figures, and all patient records in the national health service. Consequently, much of the information gathered by the agency is confidential—and protecting the privacy of data is a management principium.

"We need to maintain a reputation for integrity and to be ethical in our use of data," said Brian Meakings, head of data services at the Office (in effect, the co-CIO, a position he shares with a colleague on the technology side of the organization).

To ensure squeaky-clean control of the information, 20 "data custodians," like earnest fiduciaries, oversee the use of all electronic and paper records collected by the Office. There is one custodian for each data set in the organization's domain—a custodian for birth records, another for marriage records, and so on. "We want the custodian to be an end user who genuinely understands the data," Meakings said. Consequently, at an organization where statistics are the products and services, custodians are statistician-managers, not IT professionals.

In the United States, the term "custodian" conjures up an image of the high-school janitor. Data steward is the more common idiom, hereabouts, for the same position. But Meakings said his organization wanted to steer clear of any term (including steward) that would suggest data ownership. "Ownership connotes that the data is the property of an individual," he said. "But the custodian is looking out for the data for the organization as a whole."

How? Custodians (who report directly to the heads of the Office's divisions, such as the division of the census or the division of health statistics) ensure that any legal restrictions on the data are complied with, devise guidelines for using or disclosing data, police access to the data and serve as

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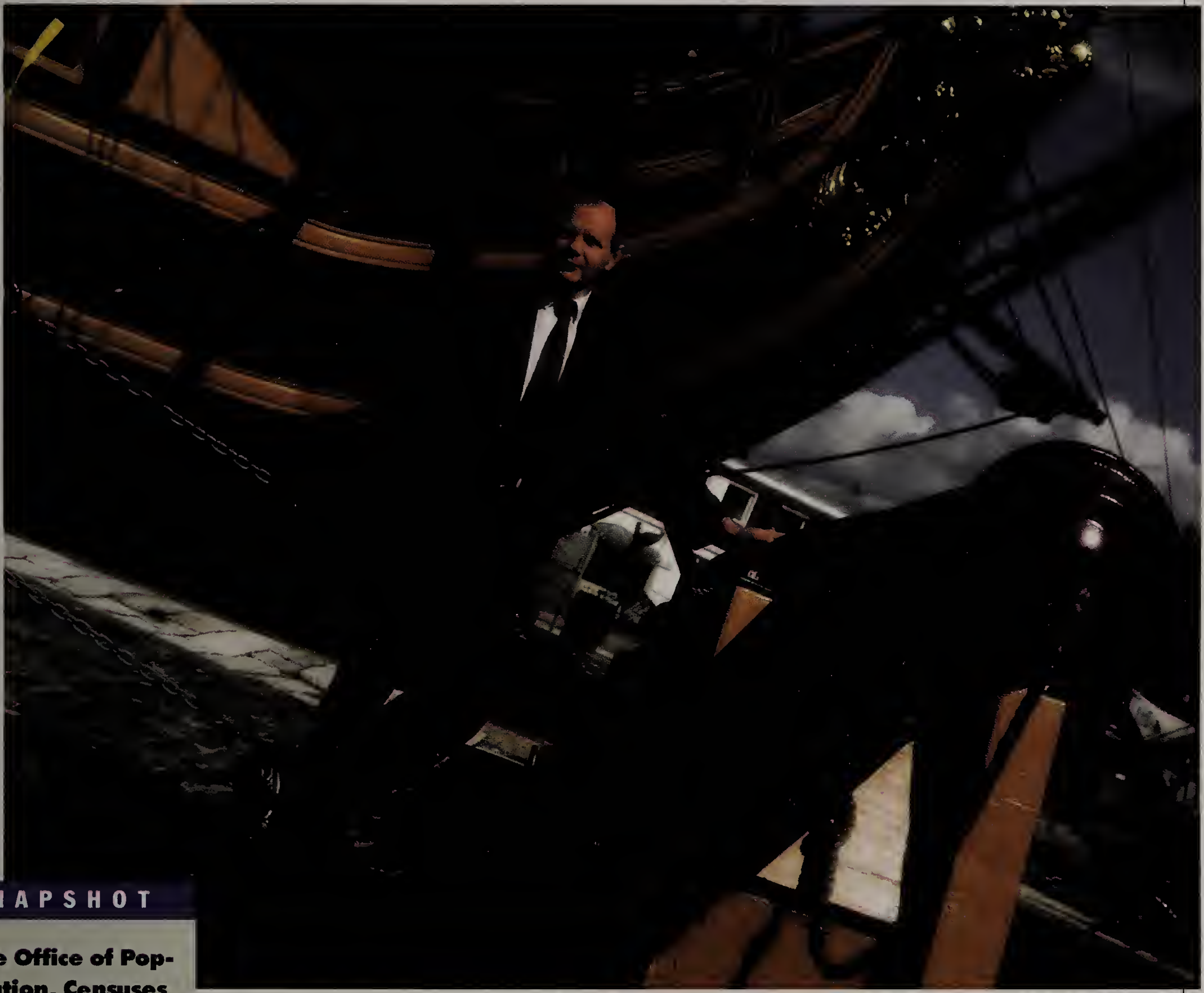

BRIAN MEAKINGS: CUSTODIANS COME FROM THE RANKS OF STATISTICIANS, NOT THE I.T. WORLD.

SNAPSHOT

The Office of Population, Censuses and Surveys, keeper of Great Britain's vital statistics, has established a cadre of data custodians who safeguard the accuracy, confidentiality and ethical use of the information the agency collects. Whenever a database is plumbed, these earnest fiduciaries make certain the rules are honored.

liaisons between data users and the IT-security and data-protection offices.

When customers (often other government agencies) ask for reports that will require the linking of two or more data sets—such as figures on cancer incidence and deaths—data custodians work together to make sure that the integration won't inadvertently breach the confidentiality of individuals or stray off the paths of British data-privacy laws.

"Data custodians also have quite specific roles in setting data-quality standards," said Meakings. "This differs from group to group. For instance, the quality that you look for in a voluntary sample survey may be different from what you can get on a national census, which is compulsory."

Data flows into the office through a variety of paper and electronic mediums, so setting and policing data-quality standards is no easy task. But the trickier feat is guarding the quality of data shipped to the Office by outside organizations, such as the 14 cancer registries in England and Wales. "They are outside our direct control, so to some extent we're at their mercy," Meakings said. "The first thing we do when the data comes in is a major validation process [defined by custodians] to make sure that it is good enough for the purposes we want to use it for. If it's not good enough, it goes back to them."

Gentle persuasion about the value of quality data—and a little patriotic guilt-tripping—are the only levers that custodians have to motivate outside agencies to deliver grade-A data. That and information: Several agencies need reliable statistical information back from the Office. So what's good for the goose.... CIO

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THE DATABASE DILEMMA

INTERVIEW

MODEL CITIZEN

In 1976, Peter Chen created the much esteemed "entity-relationship" database model. Like little else in the world of high technology, his creation has kept its relevance over succeeding generations of change.

BY THOMAS KIELY AND LEW McCREARY

You might say Peter Chen taught computers to think like businesspeople. The 45-year-old Chen, who holds the Foster Distinguished Chair professorship at Louisiana State University in Baton Rouge and is a visiting researcher at MIT, designed the entity-relationship database model that many regard as among the key contributions to information technology's ongoing evolution into a full-fledged business tool. For systems designers, Chen's model proved to be an able tool for conceptualizing the particulars of a business—"entities" such as "customer," "product," "employee" and so forth—and the way they should be logically linked (their relationships) in code in order to further the aims of the enterprise. On a deeper level, however, Chen's model effectively provided a common language through which the business process and the data process could understand each other.

Although Chen put forth his ER model more than 16 years ago, it has been a singularly constant feature upon the fast-changing technology landscape. A study conducted by Washington University, in St. Louis, revealed that of the ER data elements in use in the university's databases in the late '70s, some 80 percent are still in use today. And while the elements may not have changed much, the ER model itself has shown sufficient flexibility to have remained relevant to succeeding generations of database technology—from flat-file to hierarchical to relational to object to . . . who knows?

Well, Peter Chen himself has a few ideas. For one thing, he thinks that the ER model, because of its adaptability, might be the best available glue to use in integrating disparate legacy databases. But first, he says, the model has to be made dynamic rather than static—an ongoing process that is the focus of annual conferences both in this country and abroad.

If an entity is an entity is an entity, then why is it so difficult to integrate disparate

PHOTOS BY WEBB CHAPPELL

databases? Besides the obvious problems of needing to reconcile different data formats, terminologies, programming languages and data-handling methods, most database structures do not accommodate rapid change very well. Nor, said Chen, do they adequately recognize "relationships in the real world."

For example, he believes, the relational database model "has a very fundamental fatal flaw: It doesn't really treat the concept of relationship." Data elements reside in tables, and those tables can be linked; but designers and integrators can often lose sight of the real business meanings aimed for in those linkages.

"The elements are related, but how they're related is not clear," Chen said. "When we build huge relational databases, what we really have is many isolated tables with tabulated information, and we have no linkage between them. That's the same problem we have today with so-called islands of information" residing on discrete machines.

What Chen's competing model supplies is the intellectual connections that link one business fact to another in a busy enterprise, transforming organizational entities into corporatewide information webs. "The ER model has the concept of relationship. The concept of relationship is the bridge between those islands."

Think of the ER model as a blueprint, Chen says. You can lay it out on the dining room table and see all the details of the building you intend to construct: how each detail is related to the others, how it all fits together. But models are one thing, code another. There are today very few true executable ER database management systems, Chen concedes. "[That's] because the ER model is much closer to human thinking." And the closer the data methodology comes to simulating human thought, the more difficult it is to implement as a DBMS product. "It takes more time to get [the technology] mature enough to be commercially profitable." But he asserts that the day of an executable ER product is approaching and that, in fact, modest, scaled-down ER implementations are possible at present. "For example, when you look at the IBM data repository, it's basically an ER DBMS on top of a relational core."

"You have to realize that you cannot build stable models anymore. Everything is changing: Business is changing; the world is changing. So you have to anticipate change. You have to build models flexible enough to accommodate change."
—Peter Chen

Still, he argues, his model is a handy tool—today—for integrating other database structures. Take your flat-file database, he advised, and rewrite it using the ER model. Then do the same with your relational database. Finally, write code to integrate the two ER-stamped databases, linking like entities and preserving relationships. The ER model provides both the broad and the particular vision integrators need to get the job done—something that the relational model and others cannot do, Chen contends.

"The relational model is very technically oriented; there are too many mathematical jargons," he said. "It does not have a way to describe the world. The ER model provides a language that helps businesspeople to communicate with IS people. I've come to think that the most powerful aspect of the ER model is its communication aspect. You don't need a lot of training to understand it."

For example, at a company Chen consulted for, the CIO asked a curmudgeon from the accounting department—a man unschooled in computerese and skeptical of IS—to sit in on an ER modeling team's meeting. "After 50 minutes of introduction to the model by someone on the team (not me), he went to the blackboard and began to change the diagram for those areas related to him."

"THE PAST CONCEPT OF 'TELEPHONE' DOESN'T WORK anymore. In the past, the telephone number was always associated with a physical location—your office. Now the telephone set has nothing to do with the telephone number. We're changing the concept of the telephone itself, the telephone set, and also the telephone number. And also the relationship between person and telephone number."

—Chen

Even the much-vaunted object-oriented paradigm falls short, Chen says. While it's true that object-oriented data structures have much in common with the ER world view, proponents of the new technology are still mired in technical details and talk about integers, real numbers and the like.

"Object-oriented technology is basically the ER concept for programming-language people," Chen said. It is still a technical methodology, he explained, not a business methodology.

When Chen devised the ER model, the typical corporation was, relatively speaking, a slower-moving institution. More to the point, the technology architectures then in place were both stable and largely inflexible. But the intervening years have produced agile, dynamic technologies that in turn have helped corporations become correspondingly flexible.

"You have to realize that you cannot build stable models anymore," Chen said. "Everything is changing: Business is changing; the world is changing. So you have to anticipate change. You have to build models flexible enough to accommodate change."

Chen offers a mundane example of how a common business entity can shift from static to dynamic. "The past concept of 'telephone' doesn't work anymore," he said. "In the past, the telephone number was always associated with a physical location—your office. You had a fixed telephone number. Now . . . the telephone set has nothing to do with the telephone number, [which] can be dynamically changed.

"Probably, in the future, even the area code can be changed. There doesn't have to be an area code associated with a physical location. Every person will be assigned a personal number. The phone will ring wherever you are. So basically, [we're] changing the concept of the telephone itself, the telephone set, and also the telephone number. And also the relationship between person and telephone number."

To complicate matters further, it should be remembered that data doesn't mean what it used to. Today data can be a voice message, a CAD/CAM drawing, or even a video image—what Chen calls different "forms" of entities. For instance, an entity "employee" may take the form of a record in a database housed on a server, or an im-

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age captured on a training video. Who knows what the future will bring?

But building flexibility into models is no easy solution—a conundrum that Chen and other ER aficionados are still struggling with. One thing is clear, however: Designing models that can anticipate and accommodate change is only possible if senior management gets involved. Yes, multidisciplinary teams, with their diverse perspectives, can foresee change better than a small functional design group. But a dynamic ER model also needs to incorporate a high-level blueprint for the enterprise. "You have to get senior managers to work with each other," Chen said. "By working with this high-level model, you can identify these problems, and you can achieve a lot of savings." Dynamic ER models not only serve as the blueprints for the enterprise and the vision for new systems—they are also an effective tool for managers of all stripes to use to reengineer the business.

"WHAT I SEE TODAY IS BASICALLY CRISIS MANAGEMENT. CIOs are spending their time putting out fires. If they keep on doing that, they will soon be in big trouble." —Chen

The shift from static to dynamic conceptual planning will also require changes within the IS organization, Chen adds. CIOs may need to hire a whole new caliber of person. "Success depends on what type of people you select to do this type of work," Chen said. "They will need to do analysis work well, be able to conceptualize complexity and translate it in an easy-to-understand type of way." People who are too sequential or have difficulty with ambiguity will hamper the ER modeling process. What is needed, says Chen, is the analyst who can see order in chaos.

"I think this is a critical issue today in many information technology shops," Chen added. "The type of people they employ now may not be suitable for the demands."

CIOs may not be suitable for the demands, either. Chen feels strongly that many CIOs are using their time badly. "What I see in many of the DB shops today is basically crisis management," Chen said. "CIOs are spending their time putting out fires. If they keep on doing that, they will soon be in big trouble."

In fact, the inability of CIOs to sit and think about tomorrow's needs may have contributed to the difficulty they now face integrating discrete systems. They did not anticipate changes in the technology when they originally built their systems—and are not anticipating change now, either.

"I always suggest that there are two things CIOs must do," Chen said. "First, they must set aside one day a week to work on a new system. Pick one new project and work on it in an organized fashion rather than trying to solve the whole mess at once or put out fires. The second thing they must do is set aside one day a month to find a quiet way to think. CIOs don't have time to think—and that's a big problem. If you don't have time to think, how can you direct the organization to go down the right path? CIOs have time, they just need time management."

CIOs who use the *ER* model to organize their thoughts and guide their application development effort will have a better chance to "get out of this big mess," Chen claims. CIO

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COMPUTING *for a* CAUSE

Salaries are lower. Budgets are usually tighter. But a number of non-profit organizations have still managed to field IS organizations that put their commercial counterparts to shame.

BY DAVID FREEDMAN

.....

Mark Cochran isn't exactly a newcomer to high-level IS. A former senior manager of KPMG Peat Marwick's IS consulting business in Washington, Cochran holds an MBA and has also worked in the IS arena for Andersen Consulting and giant pharmaceutical-maker SmithKline Beecham. But now Cochran works for a new organization, where he faces what he thinks is his greatest challenge yet: heading a massive strategic IS reorganization that will replace 28 systems with an integrated, state-of-the-art hardware and software system affecting millions of people. A multinational bank? A giant manufacturer? Try the American Red Cross.

The conventional wisdom is that non-profit is synonymous with barebones budgets, low salaries, lack of business savvy and a certain dullness that comes from working in an environment where there is no competition and little drive to pump up the bottom line. Needless to say, these sorts of qualities wouldn't as a rule produce the world's leading IS departments. But, in fact, the IS departments of some non-profit organizations could put their commercial counterparts to shame. Non-profit organizations may not all have the financial resources of large companies, but on the other hand, large companies lack a few of the non-profits' advantages—such as cores of highly motivated volunteers, including some in IS, and managers who are willing to go above and beyond for a cause they believe is more important than money.

To examine what non-profits can achieve in an IS operation, *CIO* spoke with the IS heads of the Red Cross's Blood Services group, which functions much like a manufacturing and distribution company; the Mormon

MARK COCHRAN: *There's nothing dull about tracking more than half the nation's blood supply.*

PHOTO BY KATHERINE LAMBERT

Church, which in many ways resembles a service company; and the American Civil Liberties Union, which is typical of the smaller but hard-driving non-profit.

Wary of their reputation for being dull and bureaucratic, Cochran had always tried to steer clear of non-profit organizations when he was a consultant. Then Peat Marwick assigned him to the Red Cross, and he never looked back. Eventually Cochran left the Big Six firm to accept the job of general manager of the Red Cross's Blood Services computer systems. "A lot of my peers and friends asked, 'Aren't you going to find it difficult going from the fast-paced world of consulting to the sleepy, civil-service attitude of non-profits?'" he said. "That's just not the case here, and I suspect it's not the case at other non-profits, either."

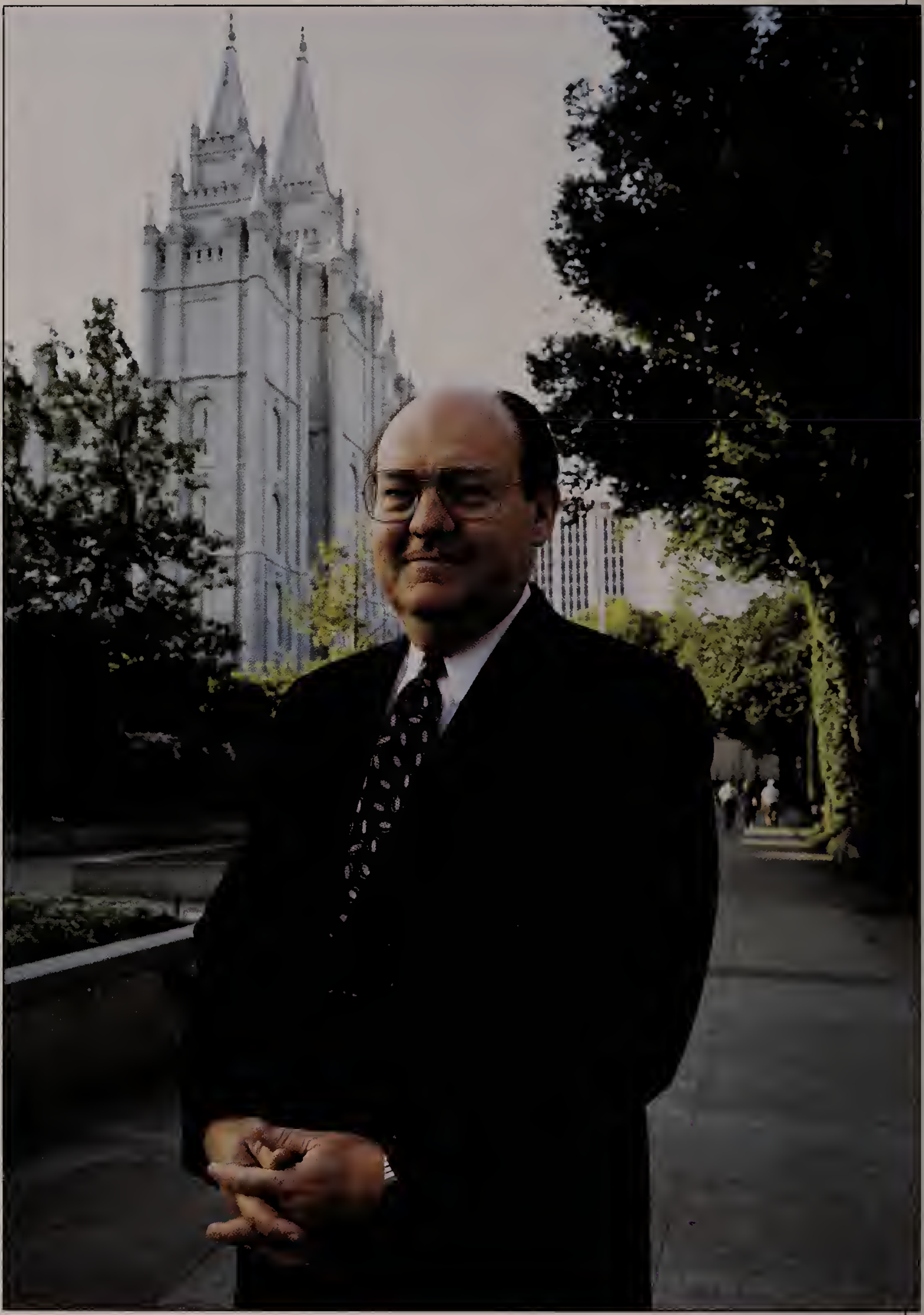
The Red Cross can't afford to be sleepy. Its $750 million Blood Services group, which is separate from the Disaster Services organization, collects blood through 50 different regional centers (or at bloodmobile or local collection facilities under the control of the centers) across the United States. It serves tens of millions of patients at thousands of hospitals. Although there are for-profit organizations that also supply blood to hospitals, the Red Cross is responsible for collecting and distributing more than half of the nation's blood supply.

The Red Cross does more than simply hand over the blood it collects, of course. Every unit is tested at a regional center for a number of diseases, AIDS among them. In addition, some of the blood is broken down and processed to make more than 100 different blood-related products.

The local minicomputer at each regional center, then, must track every unit of blood by donor, blood type, donor health, blood product and final destination. The scenarios that could result if some of this data fell through the cracks are frightening. For example, if a donor who tested HIV negative later turned out to be HIV positive, the Red Cross might be unable to determine which blood sample was his and where it had gone.

The situation is further complicated by regional mismatches in demand and supply. "In larger cities where you have major medical centers and a large number of cancer patients, it's very difficult to meet the need for blood through regional collections," explained Cochran. "In some rural regions, on the other hand, we can collect more than we need. Normally a company can balance supply and demand by simply charging more or less for the product, but we can't do that with blood. So it makes sense to overcollect in those regions that can do so and transfer the surplus to those regions that have shortages."

And there's the rub. Efficiently matching supply surpluses with short-



DARWIN JOHN: *The goal of creating value applies at a church just as in private industry.*

PHOTO BY KENT MILES

"Many people here could be making three or four times as much money, but they're committed to this organization's mission."

—Caroline Arnold

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ages requires that the regional computer systems share data. But because the regional centers have historically been fairly autonomous, they have each developed their own systems, which have proven more or less incompatible. Thus Cochran's big task over the next several years is to replace the 28 different systems operating at the 50 regional centers with a single national one.

"Right now the trend in IS is to distribute systems as much as possible so that users can tailor systems to meet their needs," he noted. "But here it's exactly the opposite—we have to standardize and more closely control IS in the 50 centers. It sounds like DP from the '60s, but actually we intend to build a lot of flexibility into the system because the business needs change so rapidly."

Some of the constraints Cochran faces in his task would be unfamiliar to his counterparts in the for-profit world. For example, some of the regional offices must be diplomatically swayed into accepting the new system. "If you're a commercial distribution business and you have 15 regional sites, you can just tell them what to do," said Cochran. "But our regional centers are run by local boards of volunteers whose advice and counsel have to be taken into consideration."

Another hurdle is set up by the federal government. Because the new system will be critical to ensuring the safety of the blood products it will be tracking, the Food and Drug Administration must approve it. In essence, the FDA treats the Red Cross as a drug manufacturer—which places further pressure on the organization to integrate its systems. "We have one license to produce blood products, and that license is held nationally, so the FDA expects that we operate the same way in all our collection and production centers," explained Cochran. "That's the way the public sees us, too. If we have a donor in Miami with a rare unit of blood and a patient in Portland that needs it, the public expects we'll know about it and can ship the blood."

On the other hand, the Red Cross has some advantages that are practically unheard of in commercial business. "We have thousands and thousands of volunteers in every possible capacity," said Cochran. "Some are even IS professionals that we use to do reviews for design changes or regional IS plans." And then, of course, there's the dedication. "We don't have anybody here that doesn't deeply want to make the Red Cross's mission come to pass," said Cochran. "I challenge you to find any company where every single person feels the company's success is extremely important to them."

The Red Cross has just finished a detailed design of the architecture for the new system; soon it will be selecting a hardware vendor. Cochran said the new system will be client/server-oriented, but it won't necessarily adhere to open systems standards. One thing is certain: The organization's approach to cost justification will differ significantly from a corporation's approach. "In the business environment you measure risk by determining how much an investment stands to add to the bottom line," said Cochran. "If a plan has a good payoff and only a 2 percent chance of failure, you do it.

"But here, the risk isn't losing money; it's sending out bad blood," he said. "If spending an extra $50 million increases our chances of success from 98 to 99.9 percent, we have to spend it. Making only three errors may not sound like a lot, but try explaining that to the people that get sick."

When Darwin John left the CIO slot at Scott Paper to take over the top IT position at the Church of Jesus Christ of Latter Day Saints, he expected things to be, well, very different. But in many ways, they weren't.

"At Scott we had all stepped back and asked ourselves what our reasons for being there were," John explained. "We decided it was to create value for all of our key stakeholders—our employees, our customers and our shareholders. Here, it's really the same thing. We have people that work for the church, our membership is like our customer base, and instead of shareholders we have the senior officials of the church. We have to create value for them through IS." As a result, many of the systems at the church are similar to those in industry: financial systems, personnel systems, purchasing systems.

But there are also some key differences. For one thing, the church's mission isn't comparable to that of commercial enterprises. "The profit sector is driven by competition and the need for short-term results," he said. "We have a different kind of urgency that sometimes comes clear down to good and evil. We want to deliver to our members and potential members something that will enrich their lives, and we feel that may be a lot more important than paper towels or Cheerios."

For IS, that means turning to some unique—and in some cases impressive—systems. For example, one of the most important tenets of the Mormon Church is that members must try to identify their ancestors as far back as possible so that they can induct them (retroactively, as it were) into the church. To that end, the church had been building an enormous mainframe-based genealogy database; but with the advent of CD-ROM players, John wasted no time in shifting direction. "Now we maintain and spin off the database on CD-ROM at nominal cost and ship it out to folks who can work on it on their PCs," he said. "The costs are dramatically lower, and it enables us to let members in Africa or South America or other less developed parts of the world work with the data in as sophisticated a way as if they had access to the mainframe database."

> *"We have a different kind of urgency that sometimes comes clear down to good and evil."*
>
> —*Darwin John*

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Another key goal of the church is to maintain constant communication with its members all over the world, which it now does primarily through printed matter. To help the church better keep in touch, John is looking into satellite-based digital radio technology, which could keep constant broadcasts of church-produced programming coming into the homes of members in even the most remote locations.

Unlike most businesses, noted John, there are few bounds on the church's growth, which puts increased emphasis on IS. "We don't have to worry about antitrust law here," he said. "Without those constraints, we can consider a future where we're 10 or 20 times the size we are now worldwide. But we can't be the size we expect to be and stay as complex as we are in some areas now. IS then becomes a key enabler to that growth, allowing us to design more straightforward processes."

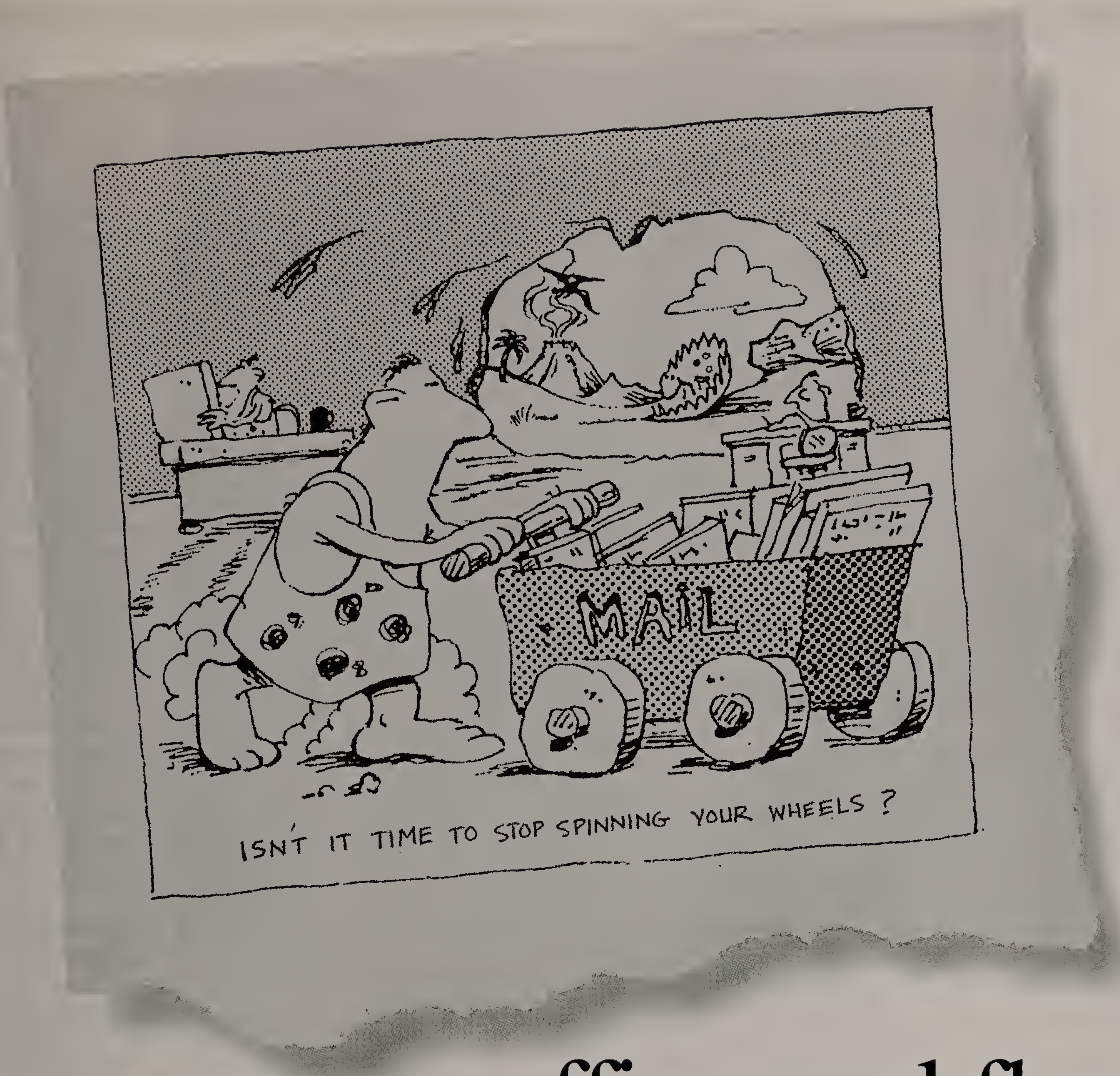
One task that hasn't gotten any easier for John in the non-profit sector is IS budgeting. "In the corporate world we've tried over the years to develop various ways to measure return on investment, and they've never worked that well," he said. "In this environment we have the same challenge of deciding where to invest. We still have to look at a set of investment alternatives and somehow sort through the relative values. It's not a science."

With an annual hardware budget of about $20,000, two part-time IS staffers—one a consultant, the other a paralegal—and a network whose most powerful machine is a '386 PC, the American Civil Liberties Union is a good example of the IS scale one might expect in a non-profit.

But that doesn't mean the ACLU's IS efforts aren't effective. Despite its meager budget and staffing, the organization has put together a national case-tracking system that most large law firms would kill for: Any ACLU lawyer in the country with a PC can tap into the system and find the details of every case the organization has been involved with in the past several years. The ACLU also maintains an electronic bulletin board that enables geographically scat-

CAROLINE ARNOLD: *Despite a sacrifice in salary, the ACLU offers added involvement and fun.*

PHOTO BY KENT HANSON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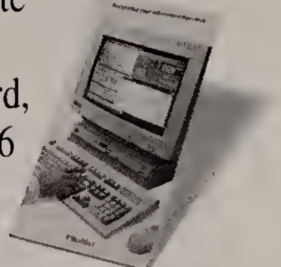

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Doing Good and Doing Well

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Taking a job in the non-profit world may mean making a few sacrifices, but it doesn't mean privation

Non-profit work may have disadvantages, but they don't necessarily include taking a vow of poverty and settling for second-rate systems. Here are some rough generalizations about the key differences between IS management in profit and non-profit organizations:

Yes, salaries are lower. But not necessarily that much lower, especially in a critical area such as IS management. "A lot of our applicants are willing to take a pay cut," said Mark Cochran, general manager of the Red Cross's Blood Services computer system. "But we couldn't get by paying 30 percent less than industry. People still have to pay mortgages."

Budgets are usually—but not always—tighter. Overall, non-profits must spend their money more carefully than commercial enterprises. IS managers typically have to shy away from the cutting edge and think in terms of systems that get the job done. That doesn't mean requests for expenditures are routinely turned down, though. "We definitely have an eye to saving money, but not at the cost of automation," said Caroline Arnold, a consultant who heads IS for the American Civil Liberties Union. "The organization understands that computers usually save money in the long run." In addition, some non-profits spend money on advanced systems that would never get funding at a corporation. The reason: They justify the investment in terms of the good it does, not in terms of the bottom line.

People have more responsibility. Non-profits are often less hierarchical and compartmentalized than corporations. The emphasis is less on doing a narrow job well and more on contributing to the success of the mission. As a result, managers often play a wider decision-making role and are kept apprised of the big picture.

There is an opportunity to make a difference. That's why people end up at non-profits: They want to do more than bring in higher returns. That motivation can sometimes accomplish what the drive for money can't. In fact, one manager contends he's operating with the ultimate advantage. "In our environment, we believe in a very real and literal way that we receive some divine guidance in our decisions," said Darwin John, head of IS at the Church of Jesus Christ of Latter Day Saints. "That doesn't mean you don't have to do your homework, but the discovery of truth can come to you in the process."

–D. Freedman

tered teams to swap files, and a statistical analysis system that helps bolster the organization's side in cases involving issues such as school integration, where decisions can turn on how numbers are presented.

The talent behind these systems is Caroline Arnold, an IS consultant who specializes in PC network and database applications. Arnold works half-time for the ACLU, where she reports to the head of finance, and spends much of the rest of her time designing and implementing applications for Fortune 500 firms. Though the companies she works for—some of which are Wall Street giants—have a great deal more money to spend than does the ACLU, they don't necessarily end up with fancier applications, noted Arnold. "Sometimes at large companies the money can actually seem tighter," she said, "because you're only dealing with a small piece of the big picture, and the approval process can be more difficult."

Still, the ACLU tends to be far more cautious about its choices in hardware and software, shying away from nonessential leading-edge technologies. "At some banks there are people who do nothing but acquire new products and discard old ones," said Arnold. "Here we can't afford to replace systems every year, so we have to carefully examine them to make sure it's something we need and that won't become obsolete." As an example, she noted that the ACLU has only recently decided to take the plunge into a fax gateway for its network after putting off the decision for a year to mull over the potential benefits.

Yet despite such constraints, Arnold said her work at the ACLU is more rewarding than her other, higher-paying jobs. "Many people here could be making three or four times as much money, but they're committed to this organization's mission," she said. "When we're struggling to get out a Supreme Court brief, I'll take phone calls in the middle of the night." Recently, for example, Arnold dropped everything to help get online the 900-page appendix to last summer's Supreme Court decision Planned Parenthood v. Casey, which upheld some limits on abortion rights.

Arnold also praises the ACLU's management structure, which, like many non-profits', tends to be flatter and more freewheeling. "There's a real feeling of participation here," she said. "You're not just writing a memo to someone who will write a memo to someone else. There's more direct responsibility, and more fun. For better or for worse, people are themselves here. The corporate world could learn from that."

Perhaps it could even profit from it.

David Freedman is a freelance writer based in Brookline, Mass.

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Information, Please

Today's computer user can get just about any information imaginable online. But with the user base for online services broadening and the variety of services expanding, the decision to go online is no longer a no-brainer.

BY MEGAN SANTOSUS

The typical business user of online information services is changing from a centralized source acting on behalf of an organization's end users to the end users themselves. This is affecting the ways vendors deliver and charge for their services and, in many cases, complicating companies' decision to go online.

Today's online services make tremendous amounts of information—the equivalent of thousands of books, newspapers and documents—available on the desktop of every PC-equipped employee. The information covers such areas as consumer and business general interest; financial, scientific, technical and professional fields; credit reporting; news; and airline schedule and reservation information. Most vendors also provide users with additional services, such as automatic text search and electronic news clipping. There are currently around 6,500 databases worldwide created by 2,500 vendors, with another 950 vendors disseminating the information. At $10.5 billion today, the online industry is projected to reach $15 billion by 1994.

In the past, most organizations assigned one employee or department to access and distribute online data on a chargeback basis to end users throughout the company. For example, a corporate information center would research patent information on behalf of the R&D department, then charge R&D for the cost of conducting that research. As a result, said George Sacerdote, a vice president at Arthur D. Little Inc. in Cambridge, Mass., vendors maintained a "usage-sensitive" pricing structure, in which the price charged depended on the time spent online—the more time spent, the lower the cost per minute. Some companies also offered deals where a certain number of searches would be included in the basic fee. With a company using only one or two access points, chances were good that a lot more than the specified number of searches would be conducted per user.

Under this arrangement, the typical business user (the information agent) wanted access to information that was both deep and broad, and the company was prepared to pay for it. With the growing trend toward end-user access, that is changing. "Occasional desktop users have a much narrower information need," Sacerdote said. To meet that changing need, vendors are offering more specialized services so users don't have to wade through a lot of extraneous material.

They are also making their services easier for the casual user to negotiate. "[Today's users] don't have the time or the willingness

ILLUSTRATION BY PHILIP ANDERSON

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to go through the protocols"—such as having to log out of their work applications or navigate through dense, text-based menus—"that were geared toward the comprehensive user," Sacerdote said. Many are adding graphical user interfaces. And they are considering pricing support strategies for making information available over corporate networks, basing prices on the number of users rather than the number of searches made.

The idea of providing access to online services across corporate networks sets off security alarms in the minds of many CIOs, according to Paul F. Kirvan, a principal of Paul F. Kirvan & Associates, an international management consulting firm in Turnersville, N.J., specializing in telecommunications. But security risks can be minimized by dealing only with high-profile, "brand name" services, he said.

"Whenever users access information from these specialized sources, there's always a potential for delivering a virus or something else that could corrupt a system," said Kirvan. "This is especially a concern [with] bulletin boards." The big-name players, however, who have their big-league reputations to uphold, invest heavily in virus detection and prevention.

The cost of online services can seem high. Most companies charge corporate customers both for access to the information and for the time spent online. (Many companies offer flat rates for household accounts because they get additional revenues from advertisers and from the vendors that sell products through the services.) According to Kirvan, fees can get expensive very quickly because it's rare for users to find what they're looking for and get off the line in two minutes or less. "The normal tendency for people is to explore," he said. "Often the service companies put up inviting messages to users to try certain things because they make more money when users spend more time."

"Costs are especially high for cor-

SERVICE SELECTION

There are hundreds of online information service providers. Here is a sampling of some of the better-known

GENERAL INTEREST

Company/Phone	Name of Service	Number of Subscribers	Description
CompuServe 614 457-8600	CompuServe	960,000	Shopping, sports, weather, hobby, travel and financial information; text search and clipping
Prodigy Services 914 993-8000	Prodigy	800,000	News, travel, stock reports, banking, special-interest information
GE Information Services 301 340-4485	GEnia	280,000	News, weather, sports, special-interest and financial information; text search and clipping

FINANCIAL

Dow Jones 609 520-4000	Dow Jones News/ Retrieval	330,000	Company, markets, industry and investment news; text search and clipping
Reuters 800 435-0101 x1	Monitor	202,000	Information about publicly traded companies; text search and clipping
Dow Jones 201 309-3000	Telerate	79,000	Stock and treasury information

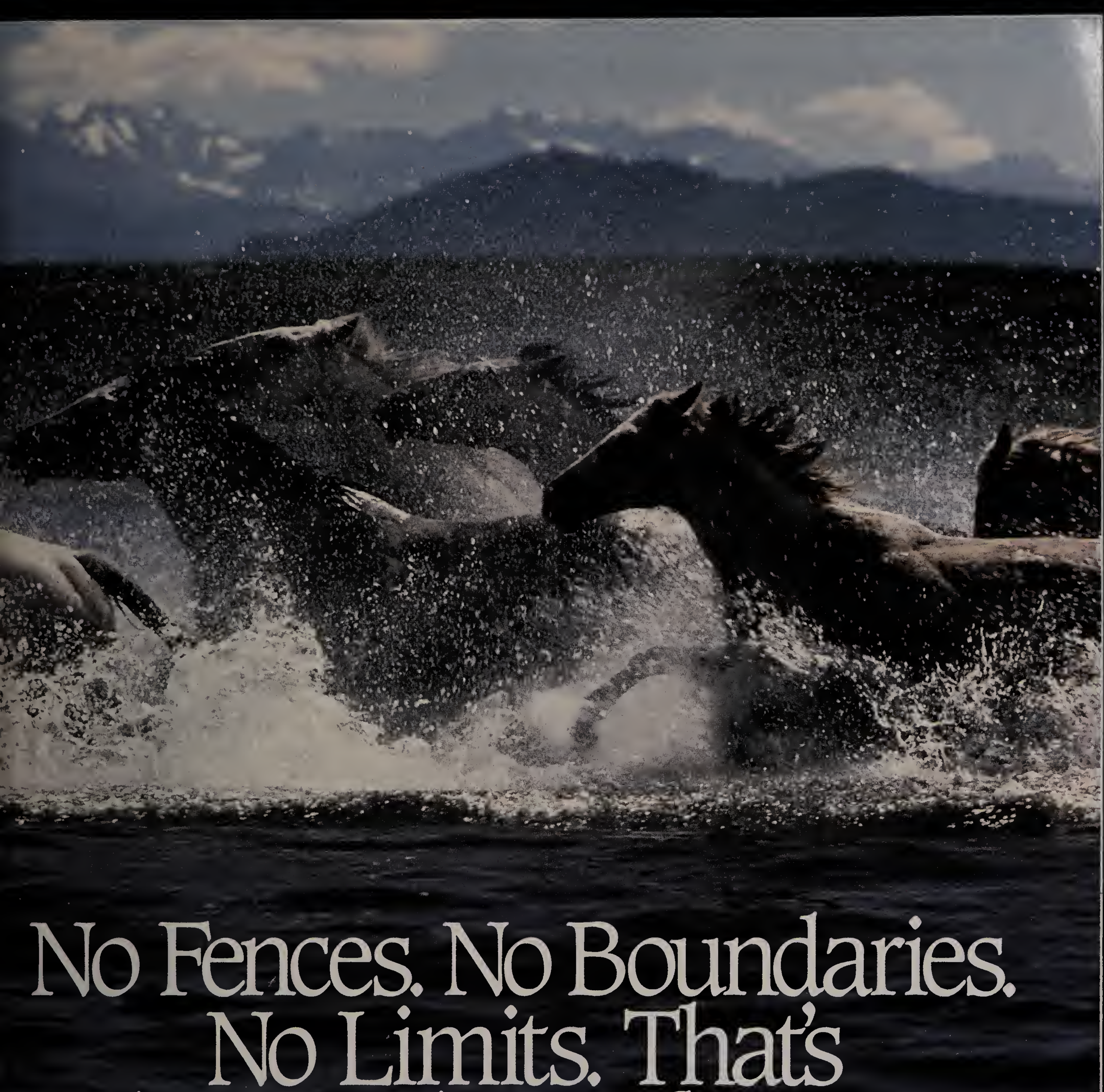
SCIENTIFIC/TECHNICAL/PROFESSIONAL

Mead Data Central 513 865-6800	LEXIS, NEXIS, MEDIS	323,950	Legal, business and medical information; text search and clipping
Dialog Information Service 415 858-2700	Dialog	141,000	Business, science and technolgy information; text search and clipping
Maxwell Communications 703 442-0900	Maxwell Online	79,600	Medical, biomedical, technical and patent data; text search and clipping

CREDIT REPORTING

TRW 714 385-7700	Credit Data Service	104,000	Individual and business credit reports
Dun & Bradstreet 800 234-3867	DunSprint/ DunsLink	86,000	Business credit and background reports; text search and clipping
Equifax 404 885-8000	Financial Control Service	60,000	Individual credit reporting

SOURCE: INFORMATION INDUSTRY BULLETIN, 1992, DIGITAL INFORMATION GROUP, STAMFORD, CONN.



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porate users because they don’t have the flat-fee option that consumers can get,” said Kenneth B. Allen, executive vice president of the Information Industry Association in Washington. But information managers who believe that costs are too high are probably not looking at the real value that online services provide, he said. “If businesses compared the costs of the services to what they replace, they’d find that costs are actually low.”

In the past, most organizations assigned one employee or department to access and distribute online data on a chargeback basis to end users throughout the company.

For example, said Allen, when a lawyer sends a clerk to a library to do research, the clerk may take hours to find the same information that could be found online in minutes. “What users don’t understand is that online services are not a one-on-one replacement for a book,” Allen said. “They are a replacement for a process or activity, and that’s where the value of the cost is found.”

Most online services copyright their material, according to Kirvan, and IS managers must keep an eye out for unauthorized distribution of the information. The possibility of copyright infringement “is multiplied by the number of users within a given organization,” Sacerdote said. “It’s now a big challenge [for vendors] to come up with a pricing scheme that’s consistent with copyright protection.” Some vendors are considering charging customers a “per-user, per-use” fee and auditing the distribution of services, he said. One of the purposes of the Information Industry Association is to provide a forum where users and vendors can sit down and discuss these issues.

Before signing up with an online service, Kirvan recommends that CIOs weigh the value of receiving information online versus receiving it in a different form—such as via hard copy, audiotext, CD-ROMs, 900-numbers or diskettes. For users who don’t need time-sensitive information, there are more cost-effective ways to get information delivered.

Online services are most easily justified in situations where large numbers of specialized users need access to continuously changing information. This is particularly true in the financial-services industries where the real-time delivery of online information is essential to decision-making and job performance. Stockbrokers could not do their jobs without online access to stock quotes, and more and more banks will not make a lending decision without checking with the online credit services, which provide more comprehensive information more quickly than traditional media.

To get the most from an online service, companies should do a little advance planning.

Establish a Business Need. The first step in deciding to go online is to make sure there is a business requirement for doing so. If a vendor offers services that cannot be obtained easily or economically by existing staff through traditional means, then there is probably a legitimate need to sign on.

Select a Service. The next step is to find the right service for particular users’ needs (see chart, page 64). This choice will be further complicated by the FCC’s decision to let regional Bell operating companies enter the market. (Right now, RBOCs are primarily involved in the delivery rather than the creation of online services. But at least some will most certainly be providing such services by 1995, according to Kirvan.) “When the RBOCs enter the picture,” Kirvan predicted, “it will be an administrative nightmare to sort through the different options as services overlap each other.”

Kirvan suggests that CIOs delegate responsibility for tracking online services to one person in the organization. That individual should maintain files on vendors and continuously monitor them for pricing structures, service agreements and special offers.

Conduct a Trial. Once the decision is made to go with an online vendor, investigate the possibility of signing on for a trial period. Many vendors have free trial offers or discounts, and larger companies often have leverage to negotiate.

Establish ground rules (including parameters for the number of users and the types of information to be accessed) and start and finish dates for the trial, and designate one or two people to oversee it. The trial should determine the ease or difficulty of access; test false authorization or security codes; run through various sequences of activities to see how many keystrokes are needed to get information; check how easy it is to download information locally or to print it on a local printer; and test for viruses with a detection program. The trial should also test the timeliness and accuracy of the information; the responsiveness and competency of the technical support service in resolving problems and questions; and the accuracy of the bill. At all times, the process should be geared toward adding value to and enhancing the underlying business strategy.

“These services are only as good as their relevance to the company,” Kirvan said. “There are lots of convenient and relatively inexpensive options available, but the CIO should keep in mind that computers are very seductive devices, and online companies bank on luring users further into their services.”

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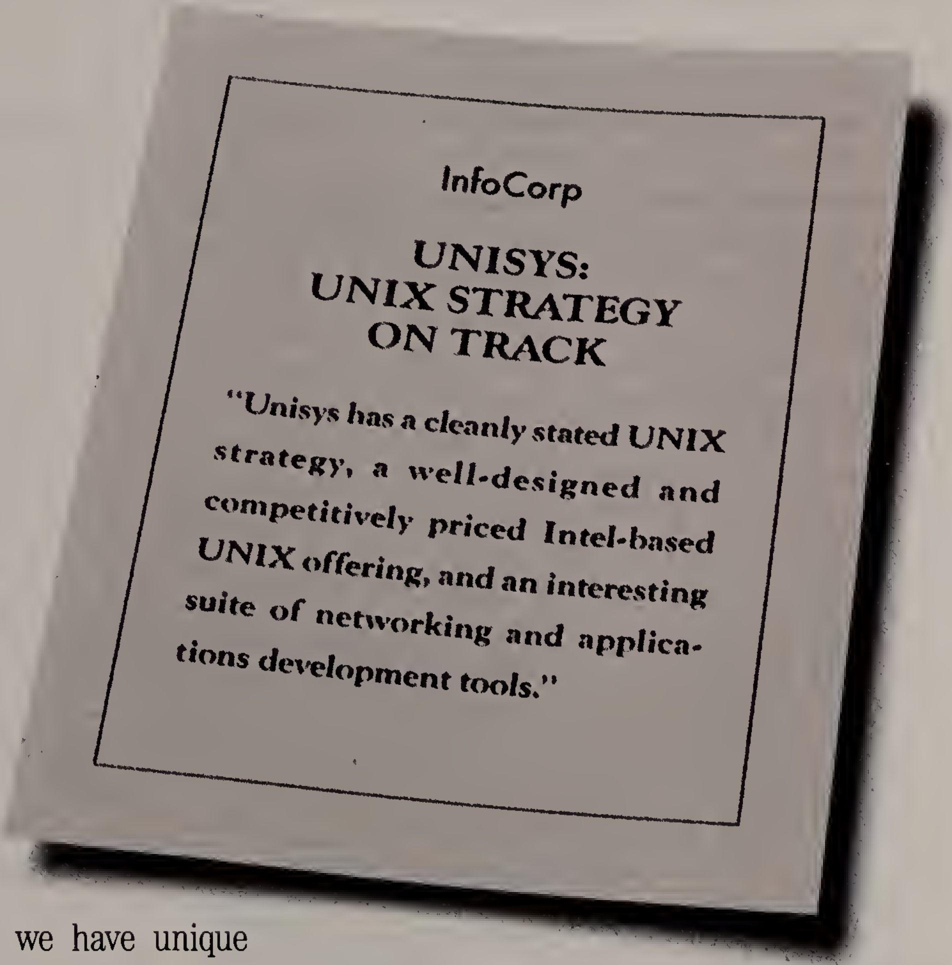

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FYI

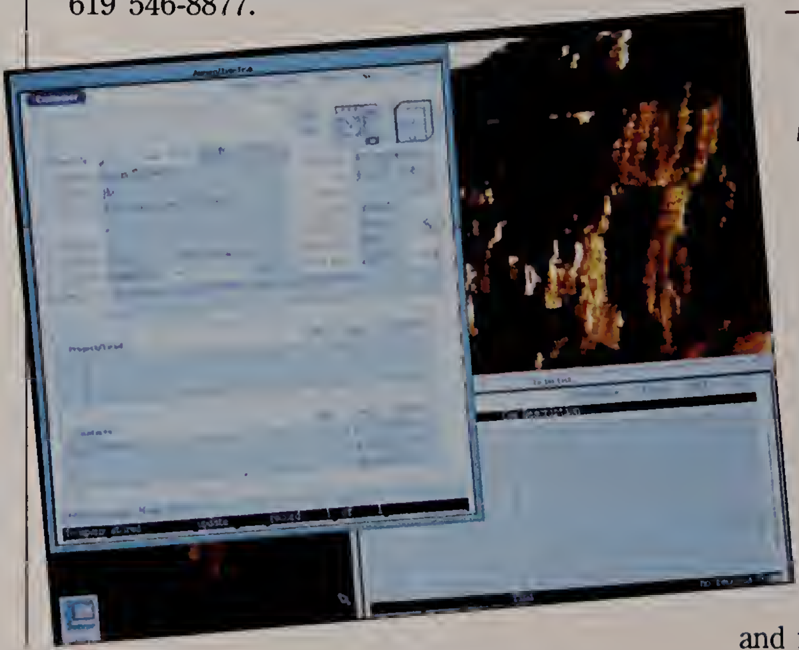
A Higher Authority

Neural networks hold out the promise of performing tasks without requiring the usual amount of human intervention and ingenuity. Rather than simply crunch numbers, they resolve inherent ambiguities and reach conclusions about those numbers, and in some cases even initiate actions. As such, they are the "higher authority" of the technology product world.

HNC Inc., of San Diego, has released a database-modeling and -analysis system—called the Database Mining Workstation (DMW)—that has the ability to "learn" key relationships among underlying data and to generalize from those relationships to produce predictive models. Rather than requiring that programmers create complex algorithms and manually perform statistical analysis, DMW "automatically extracts from mountains of data the few kernels of insight that really matter," said Ben Isner, HNC's sales manager.

The DMW has been used for such tasks as predicting river flow, diagnosing circuit-board failures, evaluating consumer credit, detecting credit-card fraud and valuing residential properties.

The system, which lists for $19,950, consists of neural net software and an HNC-design coprocessor board based on the 80-megaflop Intel i860 RISC chip. It runs under Microsoft Windows. HNC can be reached at 619 546-8877.



This Is (Not) Only a Test

Tiburon Systems Inc., a vendor of software-testing tools, recently added multimedia and multivendor platform capabilities to its Ferret system. Ferret is a group of software and hardware devices used to develop and execute automated test procedures, including requirement analysis and traceability, bug reporting and maturity analysis. Ferret also utilizes regression testing to ensure that code repairs or enhancements made as a result of test findings do not generate additional software bugs.

The new multimedia feature can be used to capture on video all requirements determined during a system's development stages—during planning meetings or prototyping, for example. Testers can call up any relevant data in a video window while designing or running testing procedures. And users can run simultaneous testing routines on multiple vendor platforms. The Ferret workstation, which consists of five software packages and four hardware systems, starts at $26,450. Call 408 293-9090.

Taking Care of Bidness

Companies that rely on getting the right bid in fast should get a case of the red hot fuzzies from a new pricing and quotation system from FuziWare Inc. of Knoxville, Tenn. FuziQuote combines fuzzy logic and fuzzy math to determine prices of custom products and services in minutes while retaining or increasing bid accuracy. FuziQuote bases its quotations on historical information regarding direct costs, key knowledge from a company's best estimators and insights into conditions such as current competitive forces or production capacity. The product reduces the time it takes to prepare a bid from as much as two weeks to about 10 minutes. Speeding up the quotation process frees engineers and salespeople for more productive activities and formalizes the pricing process so it can be linked to pricing strategy.

Each FuziQuote system is based on a set of tools that increases the speed of system development and installation. A tailored FuziQuote system can usually be developed in less than half the time of conventional expert systems and produces more accurate results.

Details on cost and development time are outlined in proposals given to prospective clients. For more information, call 615 588-4144.

Customer Service, from A to Z

Aurum Software Inc. is promising to do for customer service what MRP systems did for manufacturing: automate and integrate the entire process, from sales lead to satisfied customer.

The company recently introduced its Customer Resource Planning (CRP) System, a suite of integrated customer-support applications comprising four primary modules: Teletrak for telemarketing and telesales, SalesTrak for field sales, SupportTrak for customer support, and QualityTrak for quality management as it relates to customers. The system consolidates information from these functions into a single database for managers who need an enterprisewide view of their business.

The CRP System runs on Unix and supports all major GUIs. The applications are written in a 4GL so that they can run across multiple platforms in a client/server environment. Pricing for each module is based on the number of active users per database server and ranges from $15,000 to $200,000 for TeleTrack, SalesTrak and Support Trak; and from $10,000 to $100,000 for QualityTrak. Call 408 562-6370.

CIO

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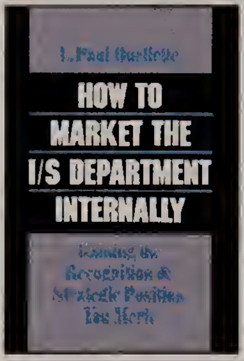
OFF THE SHELF

HOW TO MARKET THE I/S DEPARTMENT INTERNALLY

By L. Paul Ouellette
American Management Association
(New York), 1992
185 pages, $28.95



Don't be fooled by the less-than-exciting title. *How to Market the I/S Department Internally* is not a dry treatise dissecting the latest marketing theories. Rather, this informative book, written by IS veteran L. Paul Ouellette, is filled with practical advice conveyed in a breezy, anecdotal style. It's a quick and entertaining read about an important dimension of IS that CIOs have long misunderstood or completely ignored.

To overburdened CIOs who might scoff at the idea of taking on additional responsibilities, Ouellette argues convincingly for starting an internal marketing program: "Marketing can mean the difference between an IS organization that is merely an administrative function or back-room support service and one that plays an influential, strategic role in the organization."

That said, Ouellette devotes the rest of his book to defining what marketing really is (contrary to popular belief, marketing is not synonymous with *sales*). Along the way, he provides step-by-step guidance in the development of an effective marketing plan.

Marketing success can only be achieved once technical, business and interpersonal skills are mastered. Ouellette maintains that interpersonal skills—involving communication, empathy and listening—are the most likely to trip up CIOs. Consequently, he spends a lot of time offering helpful hints and exercises in the "softer" management issues.

Ouellette illustrates his points with humor and amusing facts. For example, to make the point that IS must use language appropriate to its audience, he cites a survey of high school students in which most thought Chernobyl was Cher's full name. He also quotes an array of seemingly incongruous personalities to get his message across. Whether citing Martin Van Buren, Peter Drucker, T.S. Eliot or Gary Cooper, Ouellette dispenses advice that should be relevant to every success-minded CIO.

21ST-CENTURY MANAGEMENT

By Hesh Kestin
The Atlantic Monthly Press
(New York), 1992
189 pages, $18.95

21st-CENTURY MANAGEMENT
The Revolutionary Strategies That Have Made
COMPUTER ASSOCIATES
A Multibillion-Dollar Software Giant
HESH KESTIN

Computer Associates is a wildly unconventional company that, by virtue of its idiosyncrasies, is both fascinating and successful. *Twenty-First-Century Management* is a wildly unconventional business book about Computer Associates that, by virtue of its idiosyncrasies, is neither.

Hesh Kestin, a former European correspondent for *Forbes*, is up-front about his disdain for traditional business books and his intention to produce a different animal entirely. Instead of a management case study or reader's guide to best practices, he presents a personality-heavy chronicle with "few numbers... and zero rules and regulations for better business management." His strategy is to lace a brisk, aggressively conversational narrative line through frequently long, seemingly unedited quotations from the numerous sources he interviewed at CA. The result is sometimes like reading a *60 Minutes* script without the visuals: voices, voices and more voices sporadically elucidated by often glib commentary. After a while it becomes seriously disorienting.

Considering CA's emphasis on people over process, letting the players tell their own story seems appropriate—and these folks can be colorful. A strong case could be made for a book heavily peppered with their anecdotes and insights. But Kestin lets them ramble on in dialogue that sounds like it was scripted by David Mamet. Take this quote from Chairman Charles Wang: "One we've got people. People who work for you. Work for you. But they've got to have reasons. . . . You've got to have a relaxed kind of driven. Driven but relaxed." And later: "This place gets boring. Doing the same thing you get bored. Yeah, because I get bored easily. Listen. I tell you exactly the way it is. We get b-o-o—o-red." Considering that businesspeople are notoriously strapped for time, you wonder how much patience they're going to have with such stuff.

And it's a shame, because CA is a fascinating organization. At least once a year, Wang reorganizes the company from top to bottom. Virtually nothing—from payment options to job descriptions—is written in stone. The company actively promotes from the lowest level and has so revised traditional management structures that nearly every employee manages something. Employees are ranked against each other, and managers are measured according to how much work they can get out of others. "Work at CA means getting others to work as hard as you do," Kestin explains.

And there are plenty of lessons in the paradoxes that characterize CA's operation. CA is a nearly $2 billion company that's run "like a storefront family business." Nepotism is rife, yet individual performance is stellar. The company is so frugal that it buys used office furniture, yet it also provides a free breakfast for all employees.

In an opening section, "How to Read This Book," Kestin describes *21st-Century Management* as "a business book the way *Moby Dick* is the definitive guide to marine mammals." Maybe. But Melville had a better editor.

"THE TASK IS TO INTEGRATE THE OLD AND THE NEW."

Hellmuth, Obata & Kassabaum, Architects

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